

سلسلة كتب الأستاذ

SCIENCE

Main Book

Second Term

6th Primary

Prepared by:
Ahmed Omara

Revised by:
Soha Samy
Mayada Hemed
Karim Saif Al-deen
Shadi Adel
Ahmed Elsayed



Introduction

We are proud to present to you this new educational series "Pony" in Science.

I introduce this book to our teachers and colleagues.

Also, I introduce this book to our pupils and their parents.

This book will help our pupils understand all types of questions.

We would like to know your opinions about the book, hoping it will win your admiration.

We would be grateful if you send us your comments and recommendations.

My best wishes to the pupils for success.

My respect and appreciation for the venerable teachers of Egypt.

Author,
Mr. Ahmed Omara



Contents

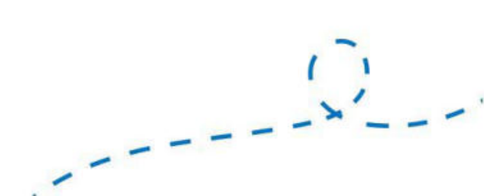
Theme 3: Change and Stability

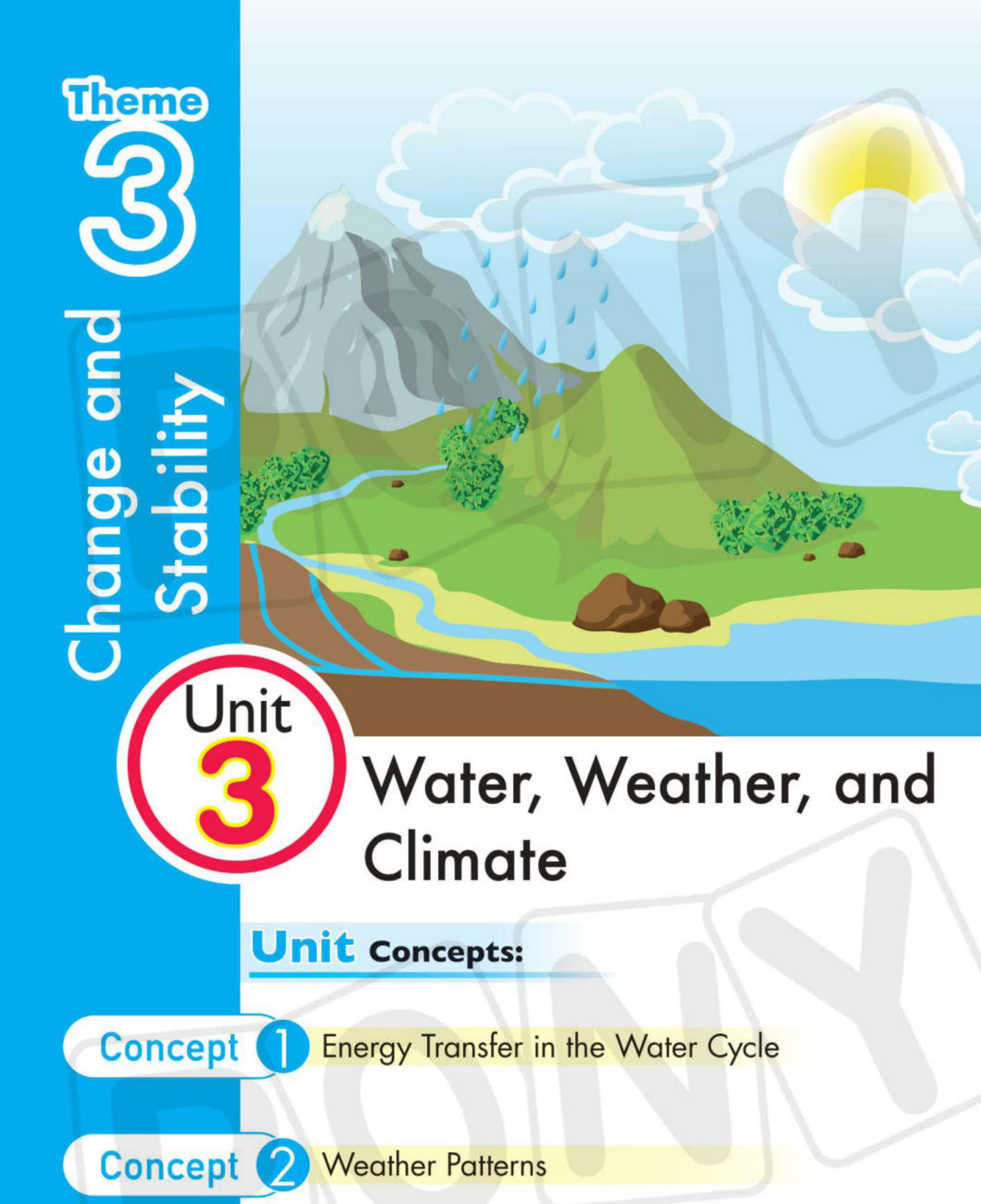
Unit 3 Water, Weather, and Climate



Theme 4: Protecting Our Planet

Unit 4 Adapting to Change





Theme 3

Change and Stability

Unit 3 Water, Weather, and Climate

Unit Concepts:

Concept 1 Energy Transfer in the Water Cycle

Concept 2 Weather Patterns

Unit Project ?????

Get Started

What I Already Know

What's the difference between weather and climate 

- Weather is the atmospheric condition in a specific place for a short period of time, such as a day.

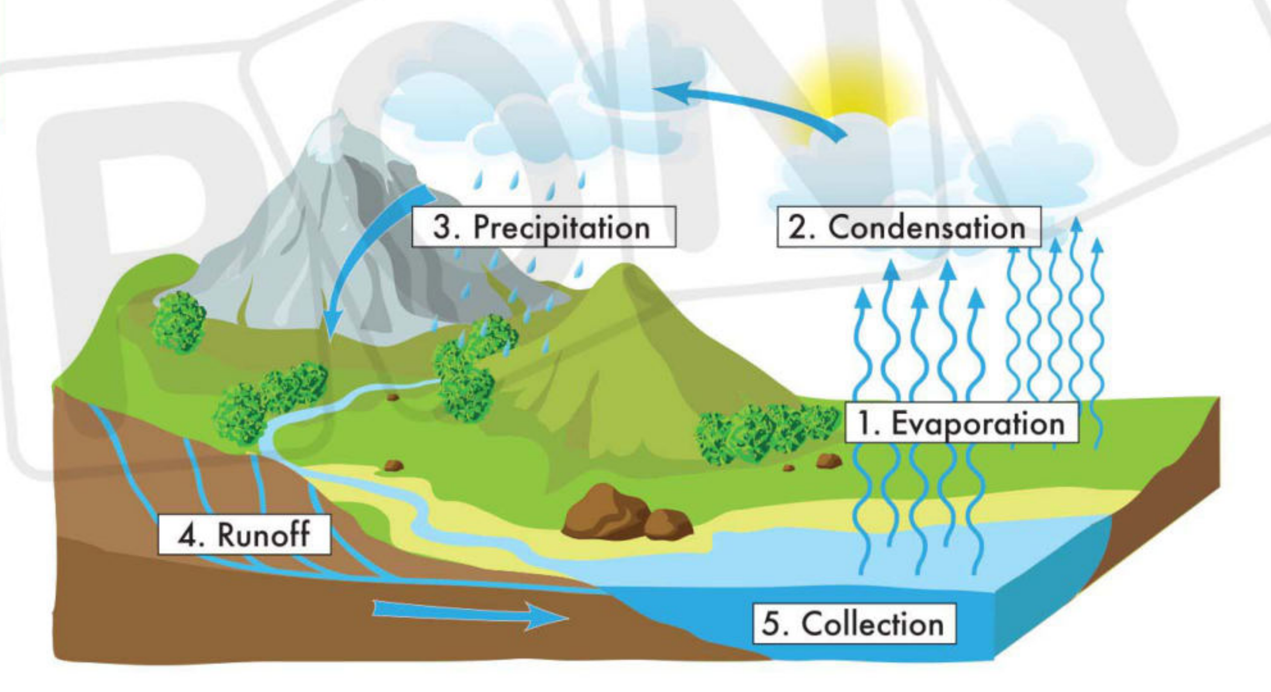
- Climate is the average weather in a place over a long period of time.

- Water cycle: It is the process by which water is continuously moving between the Earth's surface and the atmosphere.
- The continuous change in water movement causes different weather conditions, such as:



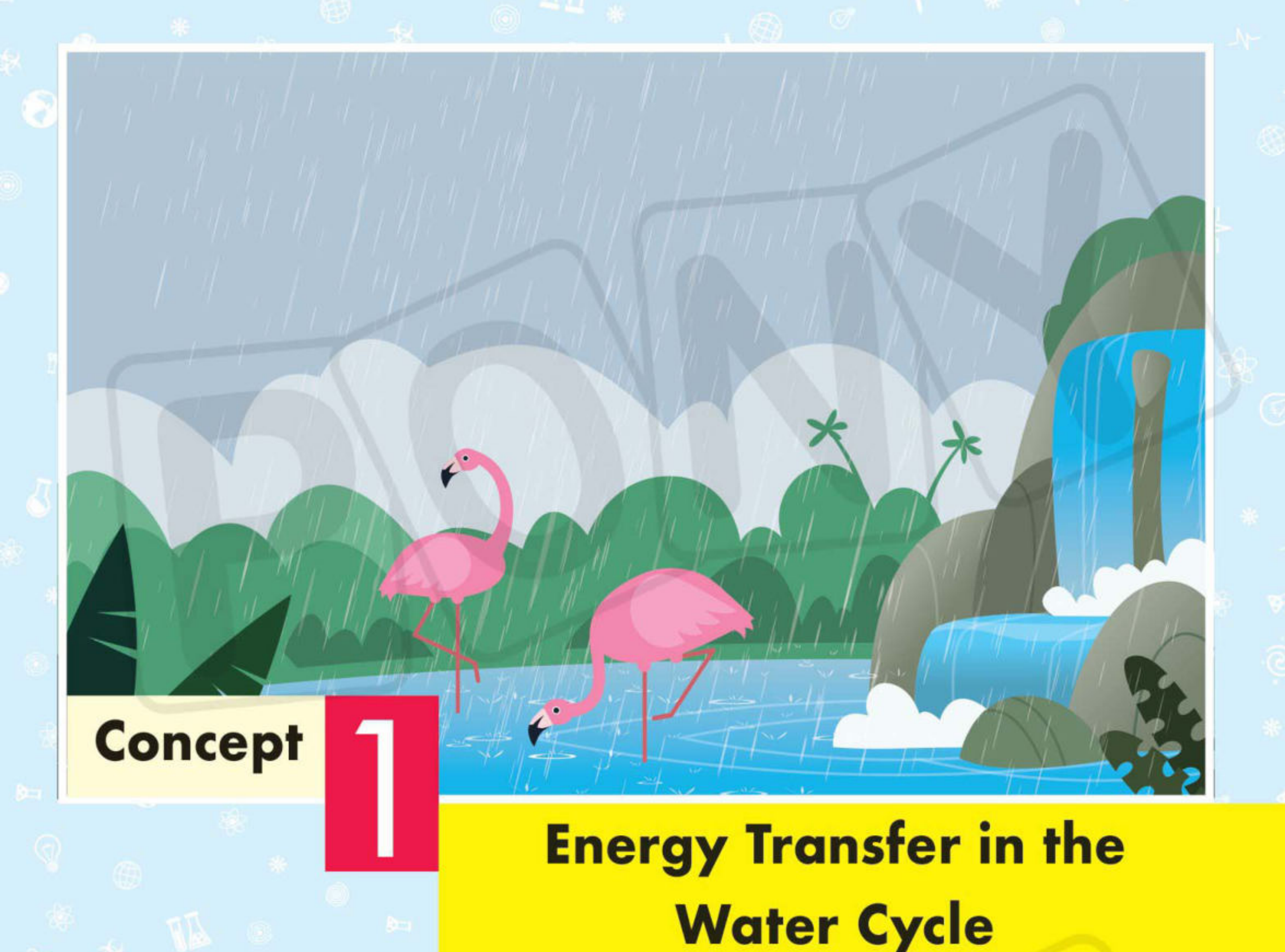
The Transfer of Energy through the Water Cycle

- The water cycle has an important role in transferring the energy form one place to another through the following steps:



- The Sun heats water so it evaporates, then it loses this energy in another place and condenses, then it precipitates and falls to the Earth's surface again due to gravity as a runoff that is eventually collected in a reservoir to be evaporated again.

Weather	الطقس	Runoff	الجريان السطحي	Gravity	الجاذبية
Climate	المناخ	Water cycle	دورة المياه	Precipitates	تهطل



Concept 1

Energy Transfer in the Water Cycle

Concept Objectives:

By the end of this concept, students will be able to:

- Find the relationships between energy transfer and matter as the Sun, wind, and water interact.
- Argue from the evidence that the addition or removal of thermal energy drives the water cycle.
- Develop a model that describes the components of the water cycle.
- Synthesize information to explain how gravity and energy from the Sun drive the cycling of water through Earth's systems.

Key Vocabulary:

- Collection of water
- Evaporation
- Condensation
- Precipitation
- Convection
- Reservoir
- Runoff
- Transpiration
- Water cycle
- Water vapor

Concept 1

Energy Transfer in the Water Cycle

Lesson 1	
Activity 1	Can You Explain?
Activity 2	Dropping Water Levels
Activity 3	What Do You Already Know About Energy Transfer in the Water Cycle?

Lesson 2	
Activity 4	How Do Solar Energy and Gravity Drive the Processes of the Water Cycle?
Activity 5	Energy and Water

Lesson 3	
Activity 6	Energy Transfer and the Water Cycle
Activity 7	Water Cycle Model
Activity 8	The Heating of Earth

Lesson 4	
Activity 9	Hands-On Investigation: Convection Currents and the Water Cycle
Activity 10	Earth's Wind
Activity 11	Record Evidence Like a Scientist: Energy Transfer in the Water Cycle

PONY

Lesson 1

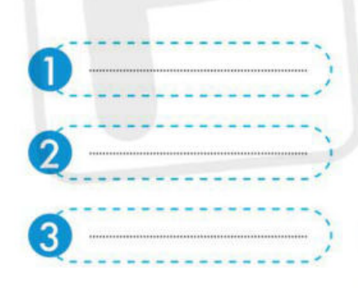


Activity 1 Can You Explain?

Warm up



Identify the states of matter in the following figure:



1. ....
2. ....
3. ....



How does energy transfer in the water cycle?

Observe the following figures, then tick on the correct answer:





1. The water in the puddle .... because of the high temperature.
   - ☐ freezes ☐ condenses ☐ evaporates
2. After a while, the puddle will be exposed to ....
   - ☐ pollution ☐ drought ☐ flooding



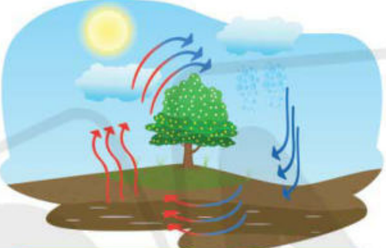
- Water in nature exists in three states on Earth:
  1. Solid (ice)
  2. Liquid (water)
  3. Gaseous (water vapor)
- Water changes from one state to another when it gains or loses energy.
- The Sun is considered the most important source of energy that drives the water cycle.
- The amount of water remains constant on Earth due to the water cycle.



How do water, wind, and sunlight drive energy transfer in the water cycle?



Sunlight provides the energy needed to melt ice and evaporate water.



Sunlight provides the energy needed to generate wind movement.



Wind causes ocean currents that transport water to different locations on Earth.

• ما دور أشعة الشمس، والرياح، والمياه في انتقال الطاقة خلال دورة الماء؟

– توفر أشعة الشمس الطاقة اللازمة لانصهار الجليد وتبخر الماء. – توفر أشعة الشمس أيضًا الطاقة اللازمة لتوليد حركة الرياح.

– تسبب الرياح التيارات المحيطية التي تنقل المياه إلى مواقع مختلفة على الأرض.



Activity  Dropping Water Levels

- There was a salt lake in Turkey.
- Over time, it turned into a puddle, then it dried up completely in the summer.
- For centuries, this lake has hosted huge colonies of flamingos.

• كانت هناك بحيرة مالحة في تركيا.
• تحولت البحيرة بمرور الزمن الى بركة ثم جفت تمامًا في فصل الصيف.
• لقرون عديدة استقبلت تلك البحيرة مستعمرات هائلة من طيور الفلامنجو.





They migrate and breed (reproduce) there when the weather is warm.

تهاجر طيور الفلامنجو وتتكاثر عندما يكون الطقس دافئًا.

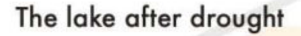
Flamingos

They feed on the algae in the lake's shallow waters.

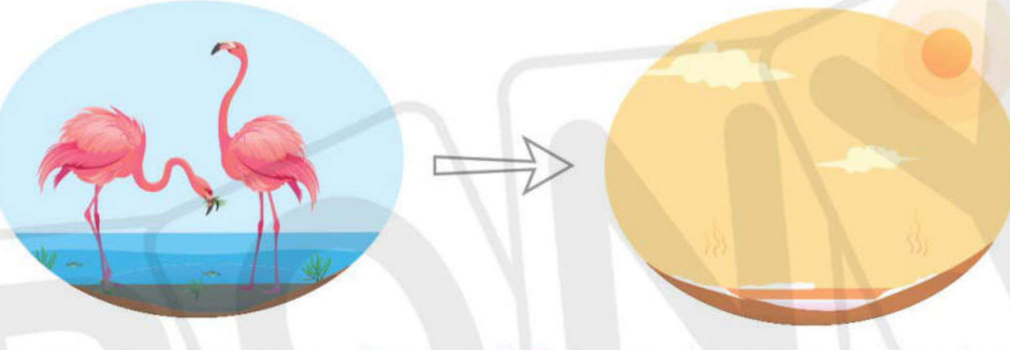
تتغذى طيور الفلامنجو على الطحالب الموجودة في المياه الضحلة للبحيرة.

How has energy transfer in the water cycle increased evaporation in the lake?

Flamingos at the lake



The lake after drought



- The water levels in lakes rise and fall due to the energy transfer during the water cycle.
- Scientists try to discover how this lake has changed in recent decades to determine ways to conserve and rehabilitate the ecosystem to protect it from climate change.

• ترتفع مستويات المياه وتنخفض في البحيرات نتيجة انتقال الطاقة خلال دورة الماء.
• يبحث العلماء في أسباب تغير هذه البحيرة في السنوات الأخيرة لتحديد طرق للحفاظ على النظام البيئي وإعادة تأهيله لحمايته من التغيرات المناخية.



Activity 3 What Do You Already Know About Energy Transfer in the Water Cycle?



» In this activity, we will study the processes and steps that affect the water cycle, which are:



1 Evaporation

It is the process in which water changes from a liquid state into a gaseous state.

2 Condensation

It is the process in which water changes from a gaseous state into a liquid state.

3 Precipitation

It is the process in which water falls on the Earth's surface in the form of rain, sleet, hail, or snow.

4 Runoff

It is the step in which water flows along the Earth's surface into streams or rivers, then into the sea or the ocean.

5 Collection

It is the step in which the water of rain is collected in different bodies of water.

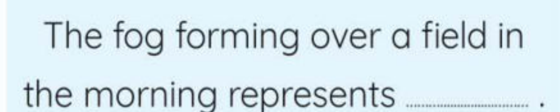
Evaporation	التبخر	Runoff	الجريان السطحي	Sleet	قطرات مطر متجمدة
Condensation	التكثف	Collection	التجميع	Precipitation	الهطول

» Use the word bank to label each example with the correct part of the water cycle:

(condensation – evaporation – precipitation – runoff)

The snow falling on a cold afternoon represents ....

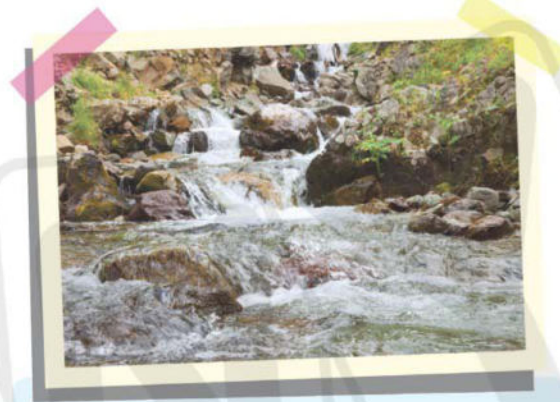




The fog forming over a field in the morning represents ....



A shallow river drying up represents ....



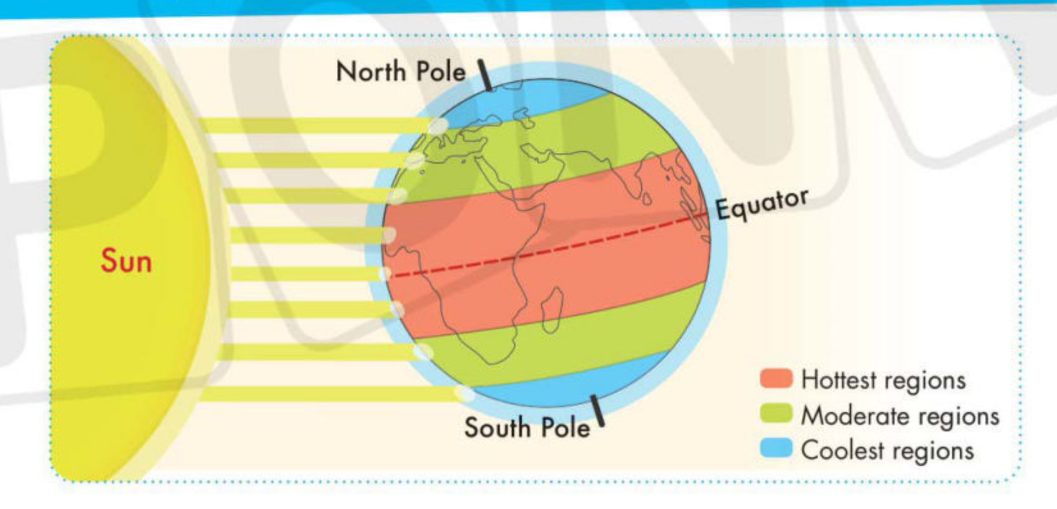
The water in a river traveling down a mountainside and into the sea represents ....

Fog	الضباب	Mountainside	سفح الجبل
Shallow	ضحل	Runoff	الجريان السطحي

Solar Energy Distribution

» The amount of solar radiation that reaches any area on the Earth's surface is unequal.

The following figure shows the distribution of solar energy on the Earth.



We can divide the Earth into three different climatic zones:

1 Hottest regions

- They are regions close to the equator.
- They have high temperature and rainfall.
- They have the highest rate of evaporation.

2 Moderate regions

- They are regions located between the hottest and coolest regions.
- They have moderate temperature.
- They have a moderate rate of evaporation.

3 Coolest regions

- They are regions close to the two Poles of the Earth.
- They have very low temperature.
- They have the least rate of evaporation.

Check your understanding?

» **Put (✓) or (✗):**

1. The regions near the two poles have moderate temperatures. ( )
2. The amount of solar radiation that reaches the Earth is equal. ( )

Exercises on Lesson 1

1 Choose the correct answer:

1. All the following processes are involved in the water cycle, except ....
   a. evaporation b. filtration
   c. precipitation d. condensation
2. Water vapor condenses when it is cooled in the atmosphere forming ....
   a. wind b. lakes c. clouds d. floods
3. .... is the main reason why evaporation occurs.
   a. The Sun b. Gravity c. The moon d. Rain
4. Water vapor .... before it precipitates back down to Earth.
   a. runs off b. evaporates c. condenses d. melts
5. Which of the following is NOT a result of condensation?
   a. Clouds b. Water vapor c. Fog d. both a and c
6. Water droplets in clouds fall when they become too heavy. This process is called ....
   a. evaporation b. condensation c. precipitation d. runoff
7. Evaporation of the liquid water to form water vapor needs ....
   a. mass b. gravity c. rain d. energy
8. Flamingos feed on the .... in the lake's shallow water.
   a. algae b. sharks c. hawks d. ducks
9. A shallow river may dry up due to the .... process.
   a. condensation b. precipitation
   c. evaporation d. melting
10. In .... regions, the rate of evaporation would be the highest
    a. moderate b. Arctic
    c. the hottest d. polar
11. Water vapor .... when it rises up in the air and .... thermal energy.
    a. evaporates – gains b. condenses – gains
    c. evaporates – loses d. condenses – loses

Unit 3

2 Put (✓) or (✗):

1. There is no energy transfer in the water cycle. ( )
2. The movement of water between the Earth's surface and atmosphere is part of the water cycle. ( )
3. Wind causes ocean currents that transport water to different locations on Earth. ( )
4. The amount of solar radiation that reaches any area on the Earth is equal. ( )
5. Some lakes dry up because of the precipitation process. ( )
6. As we move farther from the equator, the climate becomes warmer. ( )
7. The water level in the lake is not affected by any change in temperature. ( )
8. Flamingos prefer to migrate and breed when the weather is cold. ( )
9. After precipitation, water is collected in rivers, lakes, or oceans. ( )

3 Write the scientific term:

1. It is the process by which water droplets in clouds fall when they become too heavy. (..................)
2. It is the process in which the ocean's water turns into water vapor. (..................)
3. It is the process in which water vapor is cooled in the atmosphere forming clouds. (..................)
4. It is the source of energy that generates wind movement. (..................)

4 Cross out the odd word:

1. Evaporation – Migration – Condensation – Precipitation (..................)
2. North Pole – Hottest regions – Coolest regions – South Pole (..................)

5 Complete the following using the words between the brackets:

(coolest – algae – precipitation – evaporation – ocean currents – shallow – hottest – wind)

1. Sunlight provides the needed energy to generate .... movement.
2. Flamingos feed on the .... in the lake's .... waters.

3 Wind causes .... that transport water to different locations on Earth.

4 The water levels in puddles rise due to ...., while they drop due to ....

5 The .... regions are close to the equator, while the .... regions are close to the two poles.

Concept 1

6 What happens to:

1 The water vapor if it is cooled in the atmosphere?

....

....

2 The climate if we travel to a city near the equator?

....

....

3 A small puddle if it is exposed to an extreme hot weather?

....

....

4 The evaporation rate of river water if the climate becomes hotter?

....

....

7 Give reasons for:

1 Sunlight is important for the water cycle.

....

....

2 The water levels in puddles may rise.

....

....

3 Fog may be formed over a field in the early morning.

....

....

4 The water level in puddles may drop.

....

....

8 Study the following figure, then answer the questions below:

1 This figure represents the ....

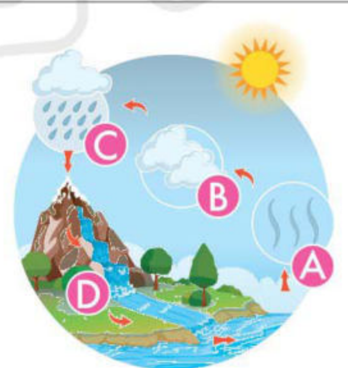
2 Label each process or step:

A. ....

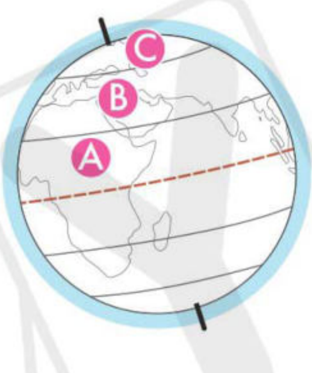
B. ....

C. ....

D. ....



9 Study the following figure, then put (✓) or (✗):



1 Region (A) has warmer climate than region (B). (   )

2 Region (C) has a polar climate. (   )

3 Region (A) always has very low temperature. (   )

4 Region (A) has the highest rate of evaporation and precipitation. (   )

10 Study the following figure, then complete the sentences below:



1 This area belongs to the .... regions.

2 The falling snow in this region represents the .... process.

3 The main source of energy needed to melt the ice is the ....

Lesson 2

 Activity 4 How Do Solar Energy and Gravity Drive the Processes of the Water Cycle?

Put (✓) or (✗):

1. Evaporation and condensation are two opposite processes. ( )
2. Sunlight provides the energy needed to evaporate water. ( )

- The Sun provides the needs of almost everything on Earth.
- Even in a dry desert environment, the water cycle is taking place.
- There is no starting point or ending point for the water cycle.

- تمدنا الشمس بالاحتياجات اللازمة لكل شيء تقريبًا على الأرض.
- تحدث دورة المياه حتى في البيئة الصحراوية الجافة.
- ليست هناك نقطة بداية أو نقطة نهاية لدورة الماء.

The Water Cycle

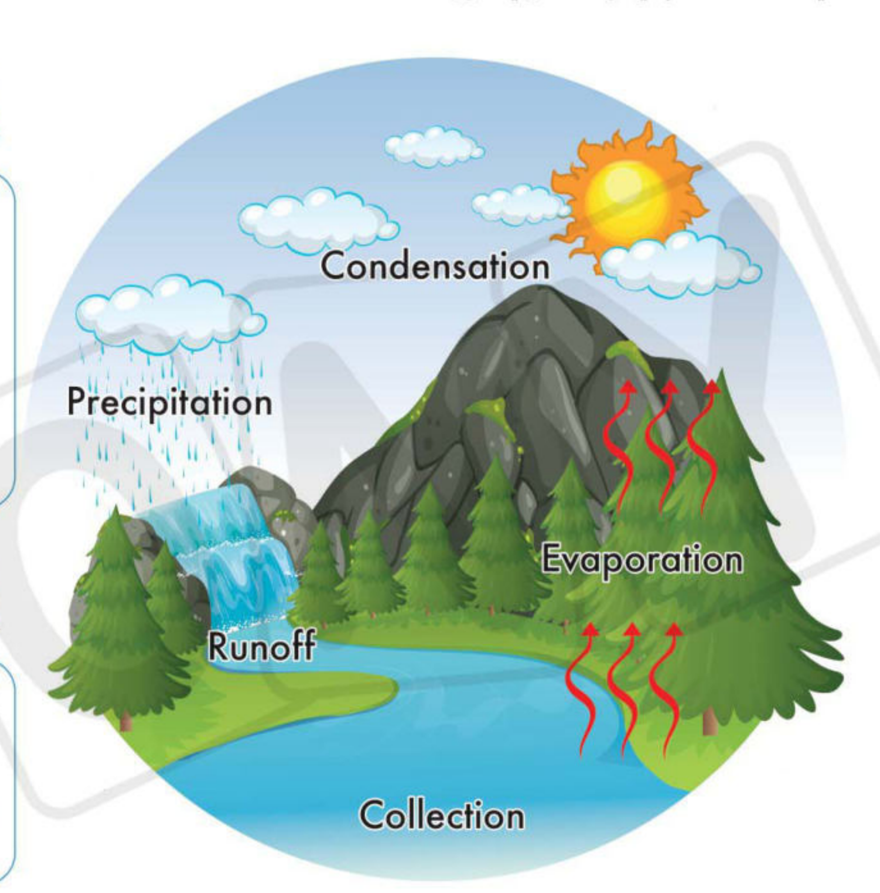
It's the continious movement of water among the various reservoirs.

دورة الماء: هي حركة المياه المستمرة في التجمعات المائية المختلفة.

A reservoir

It's the storage location of water on Earth.

التجمع المائي: هو موقع لتخزين المياه على الأرض.



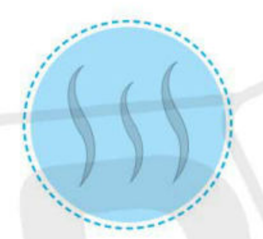
There are many forms of reservoirs, such as:

Reservoirs

- Soil
  التربة
- Rocks
  الصخور
- Living organisms
  الكائنات الحية
- Atmosphere
  الغلاف الجوي
- Oceans and Seas
  المحيطات والبحار
- Rivers
  الأنهار
- Lakes
  البحيرات
- Glaciers
  الأنهار الجليدية

The main processes and steps that move water among these reservoirs are:

1. Evaporation
2. Condensation
3. Precipitation
4. Runoff
5. Collection











- العمليات الرئيسية لنقل المياه بين تجمعات الميـاه هي:
التبخر والتكثف والهطول والجريان السطحي والتجميع.

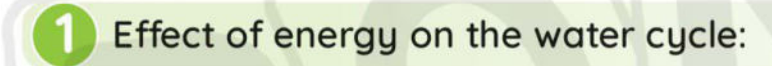
All the previous processes involve **force** and **energy**.

- كل عمليات انتقال المياه تشمل القوة والطاقة.

How do energy and force drive the water cycle 

- The two basic factors of the water cycle are the heat (thermal) energy and gravity.

• العاملان الأساسيان لدورة الماء هما: الطاقة الحرارية وقوة الجاذبية.



1 Effect of energy on the water cycle:

- The most important source of energy that drives the water cycle is the Sun.

The role of solar radiation:

- Solar radiation provides the energy to melt ice and evaporate water.





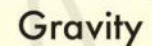
- The phase changes can also operate in reverse:
  - Water vapor releases energy when it condenses.
  - Liquid water releases energy when it freezes.

2 Effect of force on the water cycle:

- Water starts to move or change how it is moving when a force is exerted on it.
- The basic force that drives the water cycle is gravity.



Water can be moved by more than one force:



Gravity	Wind
Water can be pulled downward by gravity.	Wind works to move water.

The effect of gravity on the water cycle

Water Cycle Model

Gravity pulls	The result is
1 The ice crystals and water droplets in clouds back to the Earth's surface. تسبب الجاذبية عودة "سقـوط" بلورات الجليد وقطرات الماء الموجودة في السحب إلى سطح الأرض.	Liquid water flowing downhill in streams and rivers towards larger bodies of water. مما يؤدي إلى جريان المياه إلى أسفل في الجداول والأنهار نحو المسطحات المائية الأكبر. 
2 Solid water to flow in glaciers from areas of higher elevation to lower elevation. تتسبب الجاذبية في تدفق المياه في الحالة الصلبة (الثلج) في الأنهار الجليدية من مناطق عالية الارتفاع إلى مناطق منخفضة الارتفاع.	The water melting and flowing across the land or into other bodies of water. مما يؤدي لانصهار الثلج وتدفقه عبر الأرض أو في المسطحات المائية الأخرى. 
3 Liquid water to percolate (leakage) down into the ground to the groundwater reservoir. تسبب الجاذبية تسرب المياه إلى الأرض ومنها إلى خزانات المياه الجوفية.	Groundwater flowing from areas of higher elevations to lower elevations. مما يؤدي لتدفق المياه الجوفية من مناطق عالية الارتفاع إلى مناطق منخفضة الارتفاع. 

Check your understanding?

Put (✓) or (✗):

1. The most important force that drives the water cycle is the sun. ( )
2. Liquid water releases energy as it freezes. ( )

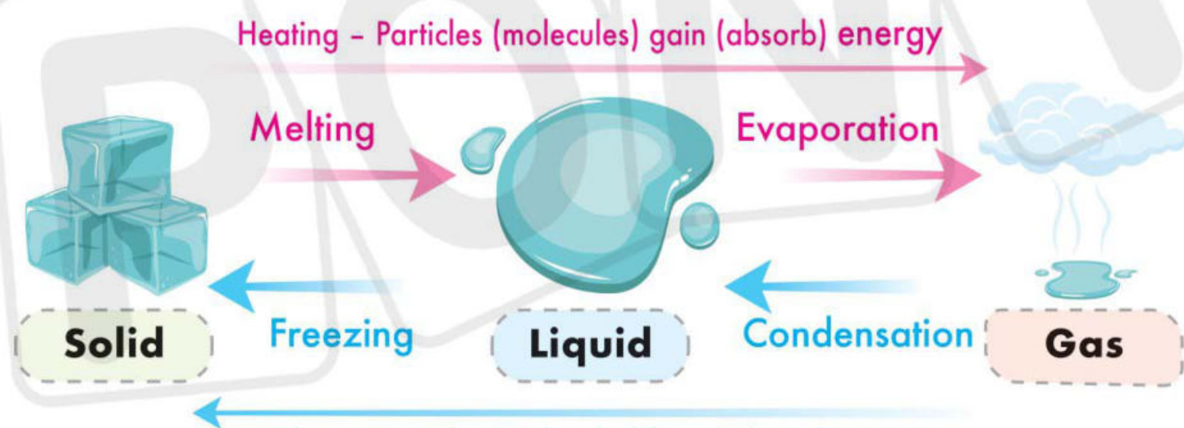


Activity 5 Energy and Water



Transfer of Energy:

- The change in energy causes changes in states of matter.



Energy and the Water Cycle:

- In the water cycle, water changes from one state to another by absorbing or releasing energy.
- As air moves from one place to another in the atmosphere, it can gain or lose energy.

• التغيرات في الطاقة (اكتساب أو فقدان الطاقة) تؤدي إلى تغير حالات المادة.
• عندما يتحرك الهواء من مكان إلى آخر في الغلاف الجوي، يمكن أن يكتسب أو يفقد الطاقة.

Factors involved in changing the states

1 Changes in Energy

Gaining or losing energy affects what happens to the water molecules in the air.

2 Motion of Air

The motion of air from one place to another can result in changing the water state according to the molecules of water that absorb or release energy.



1 Evaporation

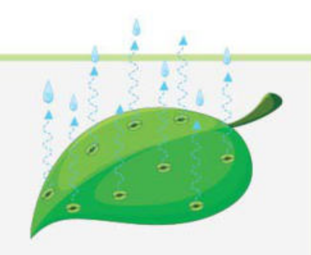
- The Sun heats water in different aquatic bodies, such as:

  Oceans | Seas | lakes | Streams | Rivers

- This leads to the evaporation of water and changing it into water vapor.

- Evaporation takes place in the leaves of plants in a process called transpiration.
- Transpiration is a form of evaporation.

Transpiration



It's the process in which the plant loses the excess water in the form of water vapor through pores on the leaves called stomata.

هي عملية يقوم بها النبات حيث يتخلص من المياه الزائدة في صورة بخار ماء من خلال فتحات صغيرة في أوراق النبات تسمى الثغور.

- About 10 % of the water vapor in the air comes from transpiration.



You can observe transpiration when a plant is set in the Sun with a plastic bag tied around the leaves.

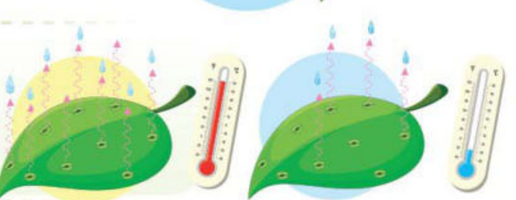
يمكننا ملاحظة النتح من خلال مراقبة نبات صغير في الشمس ملفوف بكيس بلاستيكي.

Transpiration depends on the temperature and the size of the leaves.

Transpiration in big leaves is greater than in small leaves.



The rate of transpiration increases when the amount of solar radiation increases.



Give a reason for:

- The transpiration process plays a vital role in the water cycle.

  Because trees and other plants help balance the water cycle by ensuring that there is always a lot of moisture in the air.



- Condensation occurs when the saturated air that is full of water vapor cools.
- As a result of cool temperatures, water vapor turns back into a liquid.
- Condensation occurs when clouds are formed.

• يحدث التكثيف عندما يبرد الهواء المشبع بالماء (المليء ببخار الماء).
• يتكثف البخار ويتحول إلى سائل نتيجة لانخفاض درجات الحرارة.
• يحدث التكثف عندما تتشكل السحب (السُّحب عبارة عن قطرات ماء صغيرة تتكثف في الهواء).

How are clouds formed?

1	2	3
Water vapor in the air is condensed forming water droplets.	Water droplets attach to the particles of dust, smoke, and pollens.	Billions of these water droplets join together, forming a cloud.



• كيف تتكون السحب؟
1 تتكون السحب من تكثف بخار الماء في شكل قطرات الماء.
2 تلتصق قطرات الماء بجزيئات من الغبار والدخان وحبوب اللقاح في الهواء.
3 عندما تتحد بلايين من قطرات الماء معًا فإنها تشكل سحابة.

NOTE:

- Clouds consist of millions of tiny water droplets that have condensed out of the air. • تتكون السحب من ملايين قطرات الماء الصغيرة التي تكثفت من الهواء.

Classify each description of air motion according to the suitable process, condensation or evaporation.



1. Warm air rises and moves over cooler mountains.



2. A puddle in a hot desert becomes smaller and smaller.



3. Energy from the Sun heats the top layer of water in the sea.



4. Warm, moist air touches a cold glass of tea.

Condensation	Evaporation

Exercises on Lesson 2

1 Choose the correct answer:

1. The .... is the main source of energy that drives the water cycle.
   a. moon b. gravity c. Sun d. Earth
2. All the following are considered reservoirs, except ....
   a. oceans b. lakes c. rocks d. stars
3. Gravity causes the .... process.
   a. evaporation b. condensation c. precipitation d. transpiration
4. Plants' leaves give off .... during the transpiration process.
   a. oxygen b. water vapor c. carbon dioxide d. nitrogen
5. .... is the change of water vapor into water droplets in the air.
   a. Evaporation b. Condensation c. Precipitation d. Transpiration
6. When water vapor condenses, the water droplets form ....
   a. steam b. clouds c. runoff d. reservoirs
7. All the following processes require absorbing heat energy, except the .... process.
   a. evaporation b. condensation c. melting d. transpiration
8. .... and .... processes release energy.
   a. Evaporation – condensation b. Condensation – transpiration
   c. Freezing – condensation d. Transpiration – evaporation
9. The evaporation of water by plants' leaves is called ....
   a. condensation b. precipitation c. transpiration d. freezing
10. .... return(s) water to the air in the form of water vapor.
    a. Transpiration b. Evaporation c. Condensation d. a and b
11. The presence of all the following in the air helps in the formation of clouds, except for ....
    a. pollens b. smoke particles
    c. dust particles d. rocks
12. All the following factors can change the state of matter, except ....
    a. the motion of air b. the change in thermal energy
    c. the change in temperature d. the gravity force

13 What happens to the rate of transpiration in the leaves of plants when the amount of energy emitted from the Sun increases?

a. It increases.
b. It stops completely.
c. It remains the same.
d. It decreases.

14 Which statement describes matter that loses energy?

a. The ice cubes are put on the table on a sunny day.
b. In a hot spring, water changes into water vapor.
c. Water vapor condenses into water droplets.
d. The leaves of plants give off water vapor into the air.

15 In the water cycle, water moves from oceans to the atmosphere by ....

a. evaporation b. condensation c. precipitation d. runoff

2 Put (✓) or (✗):

1 Transpiration in plants contributes in the water cycle. ( )

2 The water cycle doesn't occur in a dry desert environment. ( )

3 In the water cycle, precipitation is considered the ending point. ( )

4 Gravity and heat energy are the necessary factors of the water cycle. ( )

5 The water flowing downhill in rivers is a result of wind. ( )

6 Gravity returns ice crystals in clouds to the Earth in the condensation process. ( )

7 Glaciers are reservoirs that are made up of water in its liquid state. ( )

8 Solid water flows in glaciers from a higher-elevation area to a lower-elevation area. ( )

9 The state of water changes when water absorbs or releases energy. ( )

10 90% of the water vapor in the air comes from the transpiration process. ( )

11 Water is turned into water vapor by both evaporation and transpiration. ( )

12 Water vapor is released from the pores of plants' leaves in the transpiration process. ( )

13 The human body is considered a water reservoir. ( )

3 Write the scientific term:

1 It is the movement of water among the various reservoirs. (..........)

2 It is a storage location for water on Earth. (..........)

3 It is the basic force that drives the water cycle. (..........)

4 It is the change of a liquid into a gas by heating. (..........)

5 It is the process by which a plant loses water in the form of water vapor through the pores in its leaves. (..........)

6 It is the process by which water vapor is cooled and turned from gas into liquid. (..........)

4 Complete the following using the words between the brackets:

(releases – gravity – Atmosphere – Clouds – absorbs – force – soil)

1 Water starts to move when a .... is exerted on it.

2 .... may contain water droplets or ice crystals.

3 Groundwater flows due to .... from areas of higher elevations to lower elevations.

4 .... and .... are considered water reservoirs.

5 Water turns into ice when it .... energy, and turns into water vapor when it .... energy.

5 Cross out the odd word:

1 Smoke – Dust – Pollens – Rocks (..........)

2 Runoff – Photosynthesis – Evaporation – Collection (..........)

3 Soil – Wind – Oceans – Lakes (..........)

4 Evaporation – Condensation – Melting – Transpiration (..........)

5 Living organisms – Glaciers – Dust – Atmosphere (..........)

6 Correct the underlined words:

1. In the condensation process, water vapor particles absorb heat energy. (..........)
2. When the Sun heats up bodies of water, water turns solid. (..........)
3. When water evaporates, it changes from liquid into solid. (..........)
4. Water is pulled down due to the effect of evaporation. (..........)
5. The radiant energy of the Sun causes ice to freeze and turn into liquid. (..........)

7 Choose from column (A) what suits it in column (B):

Column (A)	Column (B)
1 Gravity	a. is considered a water reservoir.
2 Transpiration	b. causes water droplets in clouds to fall back to the Earth's surface.
3 Condensation	c. is a form of evaporation taking place in plants.
4 Atmosphere	d. occurs when the air saturated by water cools.

1 .... 2 .... 3 .... 4 ....

8 Give reasons for:

1. Water flows in glaciers from a higher to a lower elevation area.

....

....

2. Dust particles in the air help in the precipitation process.

....

....

3. Transpiration process has an important role in the water cycle.

....

....

9 What happens if:

1. Gravity causes liquid water to percolate down into the ground?

....

....

2. A warm moist air touches a cold glass of water?

....

....

3. Particles of water absorb heat energy?

....

....

4. You wrapped a plastic bag on a plant?

....

....

5. You transferred a plant to a sunny place?
(According to the transpiration rate)

....

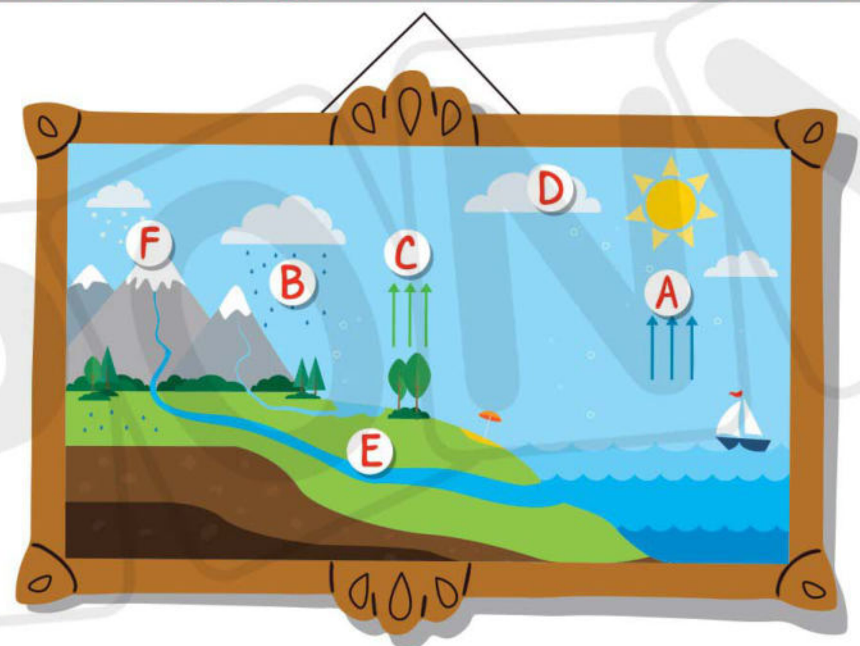
....

10 Study the following figure, then put (✓) or (✗):

1. The formation of water droplets inside the bag is an evidence of the photosynthesis process. ( )
2. When you expose this plant to more sunlight, the amount of formed water droplets inside the bag increases.( )



11 Study the following figure, then choose the correct answer:



1. Process (A) is called ....
   a. condensation b. precipitation
   c. evaporation
2. Process (C) is called ....
   a. condensation b. precipitation
   c. transpiration
3. Process (B) is called ....
   a. precipitation b. evaporation
   c. transpiration
4. The force of .... pulls water downhill in reservoir (E).
   a. magnetism b. gravity
   c. transpiration
5. When the part (F) gains heat energy, it changes into ....
   a. solid b. gas
   c. liquid
6. The formation of the part (D) is due to the .... process.
   a. condensation b. precipitation
   c. evaporation

12 Look at the following figure, then choose the correct answer:



1. In the water cycle, which process is directly responsible for water moving from plants into the atmosphere?
   a. Collection
   b. Condensation
   c. Precipitation
   d. Transpiration
2. Which natural process is responsible for the formation of the clouds above the desert in the image?
   a. Evaporation from the camel's body
   b. Transpiration from the desert plants
   c. Condensation of water vapor in the atmosphere
   d. Precipitation falling from higher altitudes
3. The puddle in the image acts as a small ....
   a. reservoir
   b. cloud
   c. atmosphere
   d. ocean
4. Which statement about the water cycle is NOT true?
   a. Water can change between all three states of matter during the cycle.
   b. The Sun's energy drives the water cycle through evaporation.
   c. Gravity plays a role in returning water to the Earth's surface.
   d. The amount of water on Earth is constantly decreasing.

Lesson 3



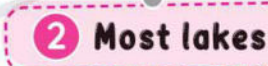
Activity  Energy Transfer and the Water Cycle

- Even though we see the water falling as rain, we can't see the water vapor in the air that forms the rain.
- Humans, animals and plants need fresh water to survive.

Resources of Fresh Water



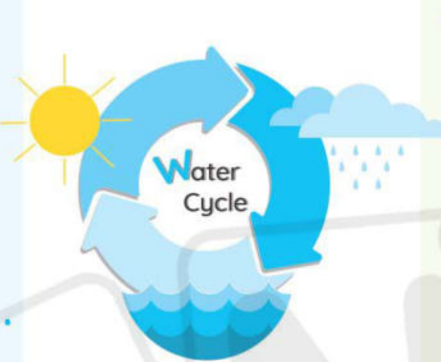
1. Rivers
2. Most lakes
3. Clouds in the sky





Nature recycles water:

- The water cycle involves the continual movement of water from oceans and freshwater sources to the atmosphere.
- تتضمن دورة المياه استمرار نقل المياه من المحيطات ومصادر المياه العذبة إلى الغلاف الجوي.



- The same water eventually falls back to Earth in the form of rain, sleet, snow, or hail.
- تتساقط هذه المياه في النهاية مرة أخرى على الأرض على شكل مطر أو صقيع أو ثلج أو بَرَد.

The water cycle includes three main processes:

1. **Evaporation**: It is the process of changing liquid water into water vapor.
2. **Condensation**: It is the process of changing water vapor into liquid water.
3. **Precipitation**: It is the process in which water falls on Earth in the form of rain, snow, sleet, or hail.

Now, we are going to study the water cycle in detail.



1 Evaporation:

- The Sun heats the liquid water of oceans, lakes, and rivers to change it into water vapor.
- Plants also give off water vapor through transpiration.

2 Condensation:

- When water vapor rises into the atmosphere, → it cools and condenses into clouds.
- When water droplets in clouds become too heavy, → they fall in the form of precipitation.

3 Precipitation:

- When precipitation hits Earth in the form of rain, snow, sleet, or hail, it may flow across the land as runoff.
- Runoff is collected in streams, rivers, lakes, or oceans.
- Eventually, water evaporates and starts the water cycle all over again.

Transpiration	عملية النتح	Precipitation	عملية الهطول	Runoff	جريان سطحي
Sleet	كرات الثلج	Hail	برد	Streams	جداول مائية

What happens when:

1 The Sun heats up the water of oceans, lakes, and rivers?

- Liquid water will change into water vapor and rise in the atmosphere.

2 The water vapor rises into the atmosphere?

- The water vapor will be cooled and condensed into clouds.

3 Water droplets become too heavy in the clouds?

- Water droplets will fall in the form of precipitation.

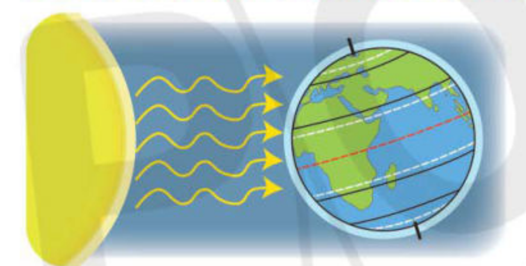
4 Precipitation hits Earth?

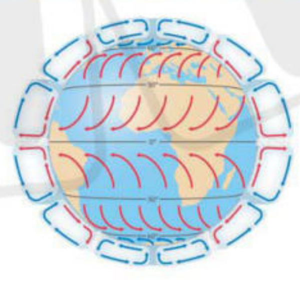
- It may flow across the land as runoff and then it will be collected in different bodies of water.

Convection: It is a way that heat transfers through fluids (liquids and gases).

- Solar energy transfers heat through space to Earth's atmosphere through radiation.

- Heat energy is transferred throughout the Earth's atmosphere through convection.





• الحمل الحراري: هو إحدى الطرق التي تنتقل بها الحرارة خلال السائل والغاز.

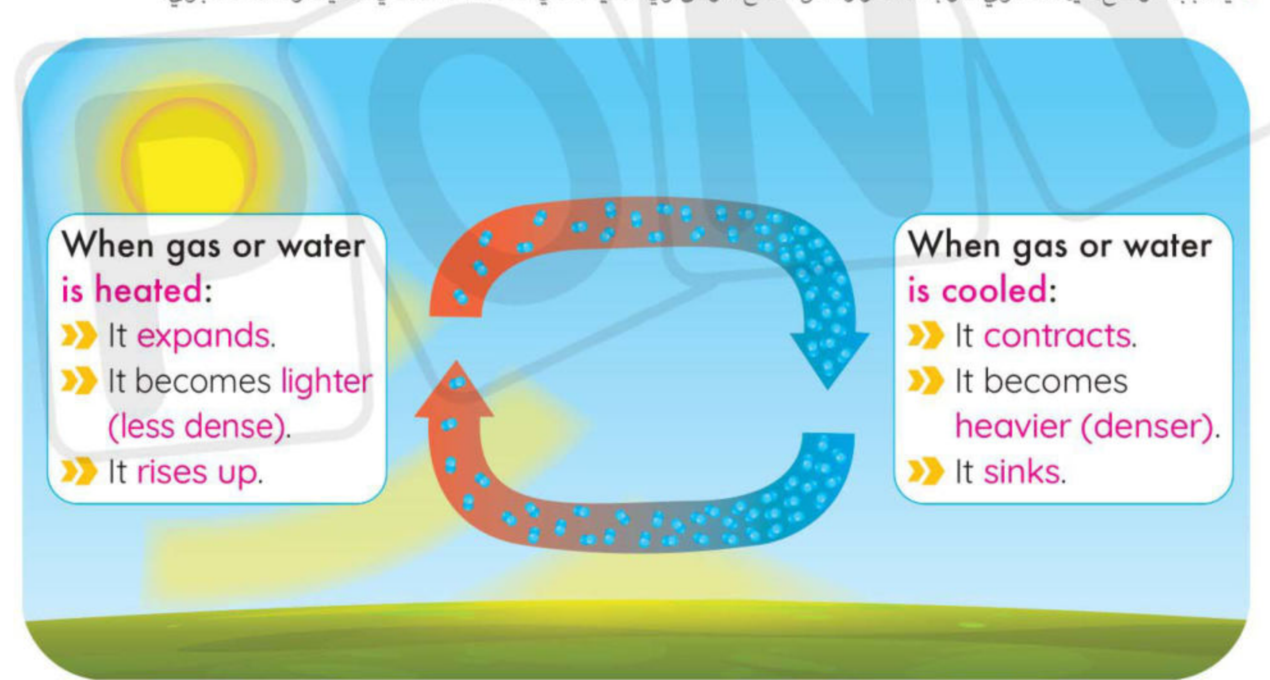
– تنقل الطاقة الشمسية الحرارة من الفضاء إلى الغلاف الجوي للأرض من خلال الإشعاع الحراري.

– ثم تنتقل هذه الطاقة الحرارية عبر الغلاف الجوي للأرض من خلال الحمل الحراري.

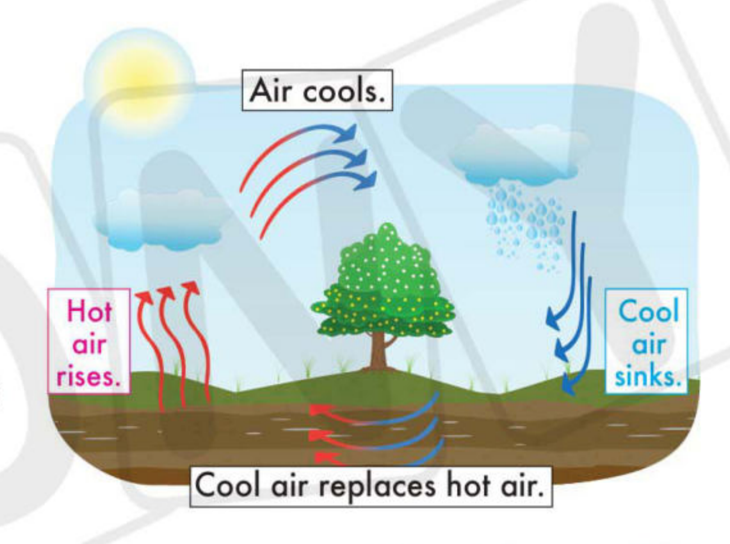
The Relationship Between Convection and Condensation

- The unequal heating of land and oceans causes different temperatures and densities in the ocean and atmosphere.

• يتسبب الارتفاع غير المتساوي لدرجات الحرارة على سطح الأرض وفي المحيطات في اختلاف الكثافة في المحيط والغلاف الجوي.



1. As warm, moist air rises, it cools and condenses into water droplets.
2. The rising of warm fluid and the sinking of cold fluid create a cycle of convection currents.
3. Gravitational force allows for the rise and fall of the different densities, creating a circulation of convection currents.



• العلاقة بين الحمل الحراري والتكثف:

١- مع ارتفاع الهواء الدافئ والرطب، يبرد ويتكثف مكونًا قطرات الماء.

٢- يؤدي ارتفاع السائل الدافئ وغرق السائل البارد إلى دورة من تيارات الحمل الحراري.

٣- تسمح قوة الجاذبية بارتفاع وانخفاض الكثافات المختلفة؛ ما يؤدي إلى دوران تيارات الحمل الحراري.

The Role of Gravity in Convection Currents

Gravitational force allows the rise and the fall of the different densities, creating a circulation of convection currents.



• تسمح قوة الجاذبية بارتفاع وانخفاض الكثافات المختلفة؛
مما يؤدي لدوران تيارات الحمل الحراري.

Circulation of Convection Current



1. It produces wind and ocean currents.



2. It helps determine regional climates.





• ينتج عن دوران تيارات الحمل الحراري:
– تكون الرياح وتيارات المحيطات.
– تساعد في تحديد طبيعة المناخ الإقليمي.

Check your understanding?

Put (✓) or (✗):

1. As warm, moist air rises, it cools and condenses. (   )
2. Water vapor is invisible. (   )

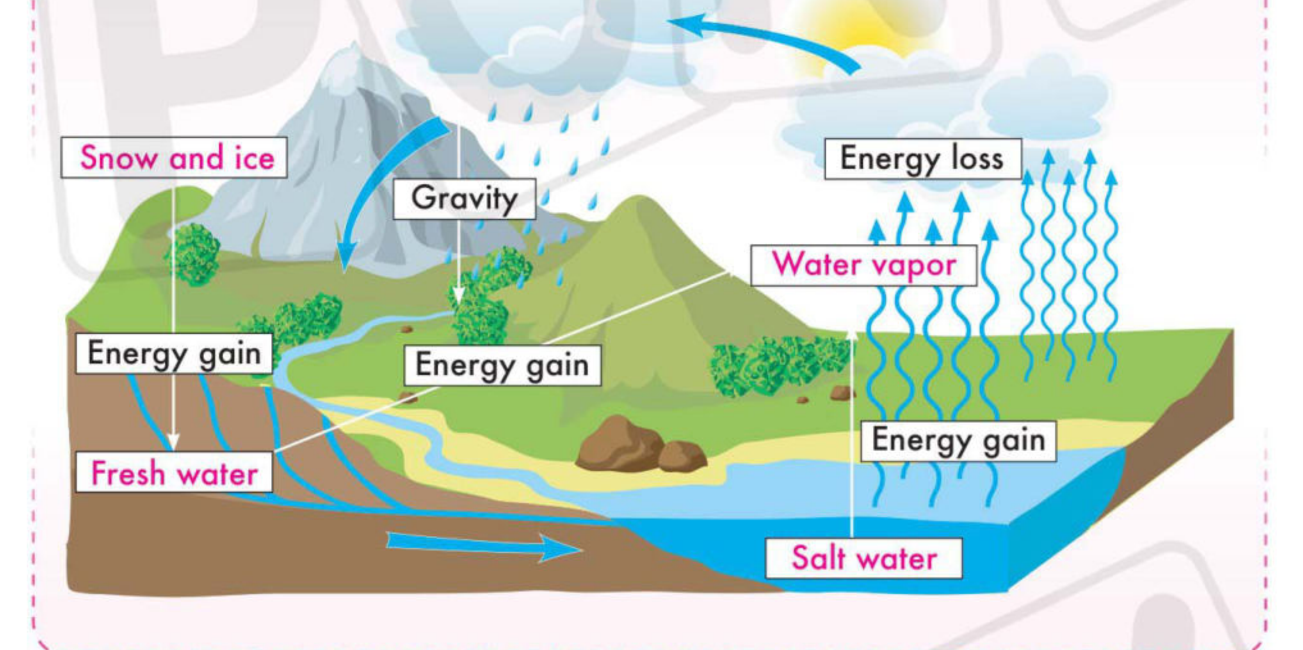


Activity 7 Water Cycle Model



Water Cycle Model

» This model shows how water moves among reservoirs on Earth.



» **Complete the following sentences using the word bank:**

Clouds – salt water – loses – gravity – condenses – heated

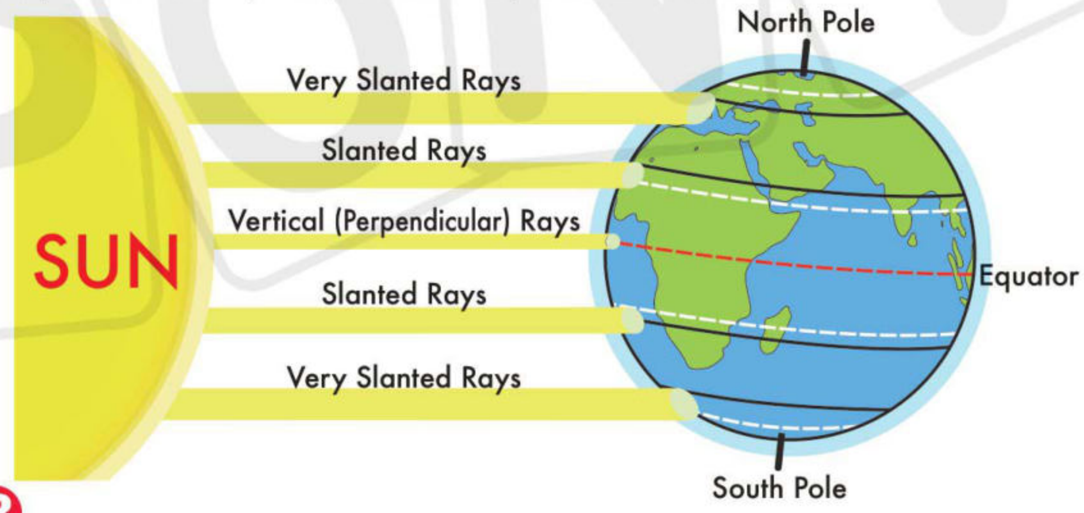
1. When .... gains energy, it turns into water vapor.
2. When water vapor .... energy, it condenses into water droplets.
3. The force of .... causes rain to fall.
4. .... are formed from millions of tiny water droplets.
5. When a liquid or gas is ...., it becomes less dense and rises.



Activity 8 The Heating of Earth



- The climate you experience depends on your location on Earth, as it is affected by the amount of sunlight that reaches Earth and the angle of sun rays falling on the Earth's surface.
- The temperture and precipitation depend on climate.





1. If you live near the equator, you feel hotter.
   Because the perpendicular rays of the Sun are focused on a small area, so their effect is greater.
2. If you live in the farthest regions, you may feel the warm and moderate weather.
   The sun rays are slanted, they are distributed over a larger area, and their effect is less.
3. If you live in an area near the two poles, you may feel very cold.
   Because the sun rays are very slanted and they are distributed over a much larger area, so their effect is less, and we feel very cold.

Check your understanding?

Put (✓) or (✗):

1. If you live near the equator, you feel extremely cold. ( )
2. The climate is not affected by your location on Earth. ( )

Exercises on Lesson 3

1 Choose the correct answer:

1. Plants give off water vapor through the .... process.
   a. photosynthesis
   b. condensation
   c. transpiration
   d. precipitation
2. Humans and animals can get fresh water from all the following, except ....
   a. rivers
   b. clouds
   c. seas
   d. lakes
3. All the following are forms of precipitation, except for ....
   a. snow
   b. rain
   c. steam
   d. hail
4. The water droplets in a cloud that fall to the ground represent the .... process.
   a. evaporation
   b. condensation
   c. precipitation
   d. transpiration
5. When glaciers are heated, they turn from .... into ....
   a. gas – liquid
   b. liquid – solid
   c. liquid – gas
   d. solid – liquid
6. When water vapor rises in the atmosphere, it cools and .... forming ....
   a. evaporates – clouds
   b. condenses – clouds
   c. melts – ice
   d. freezes – oxygen
7. Which statement is true about the relationship between convection and condensation?
   a. Convection causes condensation.
   b. Condensation causes convection.
   c. Convection and condensation are unrelated.
   d. Convection and condensation are the same process.

8 What happens when clouds become too heavy and can't hold water?

a. Water falls on the Earth as precipitation.

b. Water evaporates.

c. Another cloud is formed.

d. Clouds become very large.

9 Water vapor .... before it precipitates back down to Earth.

a. evaporates b. condenses c. melts d. freezes

10 Heat is transferred through the Earth's atmosphere by ...., while the energy from the Sun reaches the Earth's atmosphere through ....

a. conduction – radiation b. convection – radiation

c. radiation – convection d. radiation – conduction

11 What causes convection currents in the Earth's atmosphere?

a. The unequal heating on land and aquatic bodies by the Sun

b. The equal heating on land and aquatic bodies by the Sun

c. The runoff water on land

d. The transpiration process in plants

12 When air is cooled, it becomes .... and ....

a. lighter – sinks b. denser – sinks

c. lighter – rises d. denser – rises

13 Convection currents are created because the .... heats the Earth unevenly.

a. moon b. wind c. planet d. Sun

14 Heat transfers by convection currents in ....

a. fluids b. metals c. solids d. space

15 The climate near the equator is ....

a. hot and dry b. cold and wet

c. hot and wet d. cold and dry

16 As you go away from the equator, ...

a. sunlight is distributed on less area

b. sunlight is distributed on greater area

c. precipitation increases

d. the average temperature increases

2 Put (✓) or (✗):

1. For precipitation to occur, water droplets must be light enough to fall through the air. ( )
2. Water vapor is invisible, so we can see it around us in the atmosphere. ( )
3. Your location on Earth plays an important role in determining the climate you experience. ( )
4. In the water cycle, the precipitation process precedes the condensation process. ( )
5. When precipitation hits the Earth, it may flow across the land as runoff. ( )
6. When water droplets in clouds become too heavy, they evaporate. ( )
7. Steam is an example of precipitation. ( )
8. The heat of the Sun transfers through space by convection. ( )
9. Cold water is denser than hot water. ( )
10. Convection currents occur in both air and water. ( )
11. When a gas is heated, it expands and becomes denser. ( )
12. In an ocean, cold water rises and warm water sinks. ( )
13. Convection current has an important role in the condensation process. ( )
14. Deserts have too little rainfall, as they exist near the equator. ( )
15. The Polar regions have the lowest temperature. ( )
16. The equatorial regions receive the most direct sunlight. ( )

3 Write the scientific term:

1. It is the continual movement of water from oceans and freshwater sources to the atmosphere. (..........)
2. It is the process of water falling to Earth in the form of rain, snow, or hail. (..........)
3. It is the process by which water vapor is moved to the atmosphere from plants. (..........)

4 It is the transfer of heat caused by the rising of hotter fluids and the sinking of cooler fluids. (..................)

5 It is the circulation that creates ocean currents and wind currents. (..................)

4 Complete the following using the words between the brackets:

(ocean currents – collected – gravitational force – runoff – wind currents – condenses)

1 When precipitation hits the Earth, it may flow across the land as ...., then it is .... in streams or oceans.

2 When warm, moist air rises up, it .... forming water droplets.

3 Convection currents occurring in water cause ...., while convection currents occurring in air cause ....

4 The .... allows the falling and rising of air with different densities.

5 Cross out the odd word:

Rain – Snow – Steam – Hail (..................)

6 Correct the underlined words:

1 A cold fluid is lighter than a warm fluid. (..................)

2 In convection currents, warm air sinks. (..................)

3 On cooling a liquid, it becomes lighter and rises up. (..................)

4 When water molecules lose energy, they expand and become less dense. (..................)

7 Choose from column (A) what suits it in column (B):

A

Column (A)	Column (B)
1 Clouds	a. have different densities.
2 Gravity	b. help determine regional climates of Earth.
3 Gases with different temperatures	c. are made up of millions of tiny water droplets.
4 Convection currents in the atmosphere	d. is the force that pulls rain down.

1 .... 2 .... 3 .... 4 ....

B

Column (A)	Column (B)
1 Regions near the equator	a. have warm and moderate climate.
2 Regions far from the equator	b. have the coolest climate.
3 Regions very far from the equator	c. receive the most direct sunlight.

1 .... 2 .... 3 ....

8 Give reasons for:

1. Water droplets in the clouds fall in the form of precipitation.

....

....

2. The Sun is responsible for convection currents in the atmosphere and oceans.

....

....

3. Cold air sinks, while warm air rises up.

....

....

4. You feel very hot if you live near the equator.

....

....

5. Polar regions have the lowest average temperature on Earth.

....

....

9 What happens if:

1. Sun rays fall on the water in oceans and rivers?

....

....

2 Precipitation hits the Earth's surface?

....

3 Water droplets in clouds become too heavy?

....

4 Warm, moist air rises up?

....

5 You go away from the equator? (According to the temperature)

....

10 Study the following figures, then put (✓) or (✗):

Cold Air

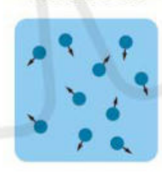


Figure (1)

Hot Air

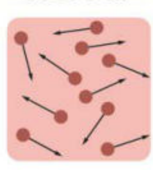
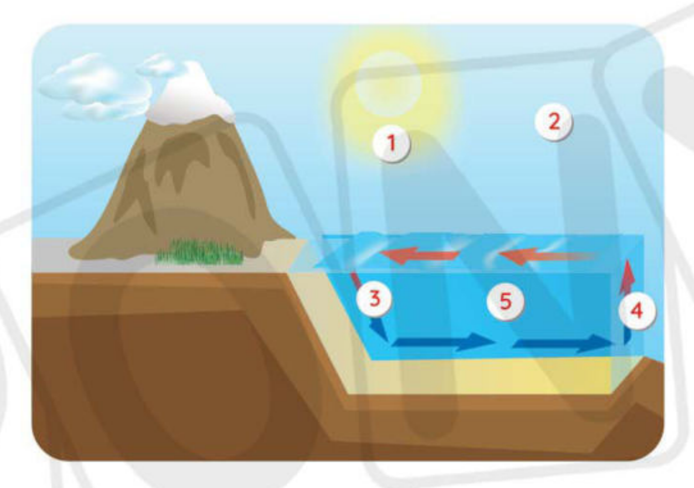


Figure (2)

1 The air in figure (1) is denser than the air in figure (2). ( )

2 On heating the air in figure (1), it will become denser and heavier. ( )

11 Study the following figure, then put (✓) or (✗):

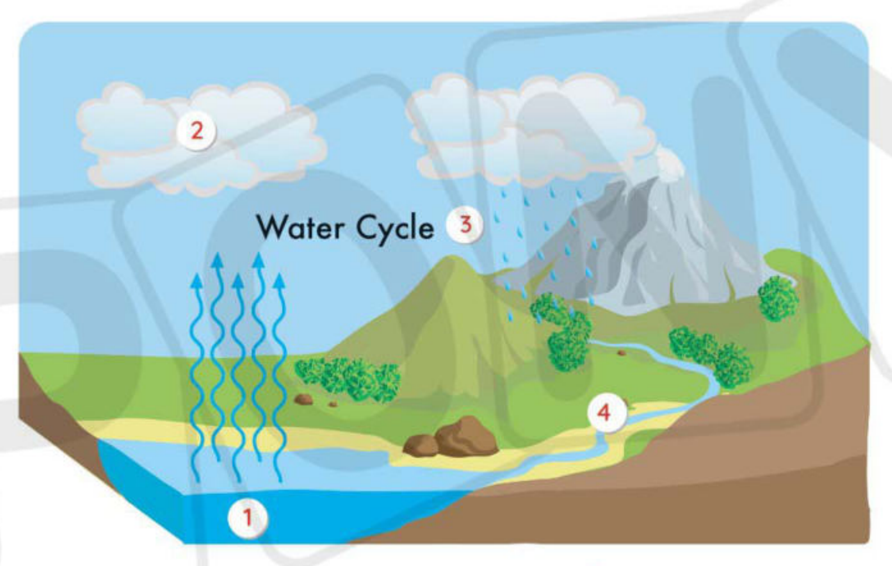


1 The heat of part 1 reaches the Earth by radiation only. ( )

2 The arrow number 3 shows the movement direction of warm water. ( )

3 Convection currents could occur in parts 2 and 5. ( )

12 Study the following figure, then choose the correct answer:



1. When the Sun heats the water in area 1, the water .... energy and becomes ....
   a. loses - water vapor b. gains - water vapor c. gains - hail
2. Part 2 is formed when water vapor .... energy and ....
   a. gains - condenses b. loses - evaporates c. loses - condenses
3. When the water droplets in part 3 becomes heavy, they will .... by the effect of ....
   a. precipitate - gravity b. condense - the wind c. precipitate - the Sun
4. The water in part 4 represents ....
   a. snow b. runoff c. hail

13 Study the following figure, then complete the sentences below:

1. Area (.......) has the coolest temperature, while area (.......) has the highest temperature.
2. The sun rays are slanted on area (.......).
3. Area (.......) receives the most direct amount of sunlight.
4. We feel very cold in area (.......).

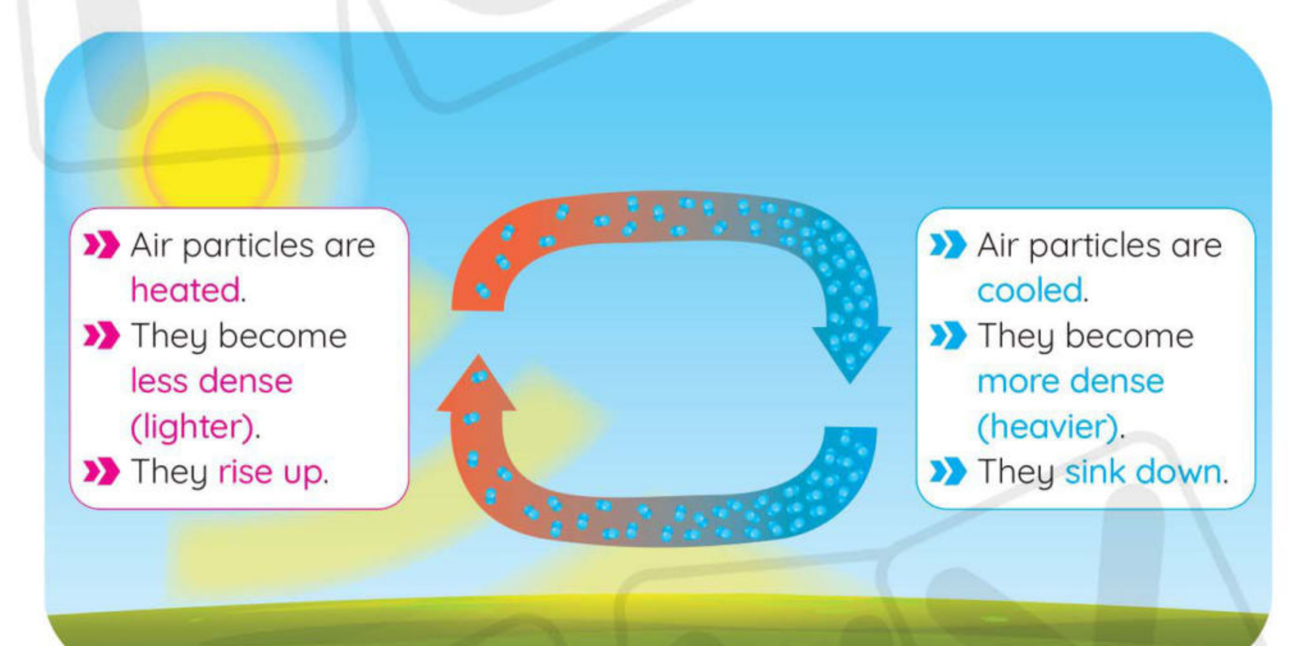
C
B
A

Lesson 4



Activity 9 Hands-On Investigation: Convection Currents and the Water Cycle

- Water can be found in different states and temperatures all over Earth, in the oceans, on land, and in the atmosphere.
- Convection is one way of heat transfer.
- Convection is the movement that occurs when hotter, less dense particles rise and cooler, denser particles sink.



Tools:



1. Two clear glass jars



2. Food coloring (Yellow and blue)

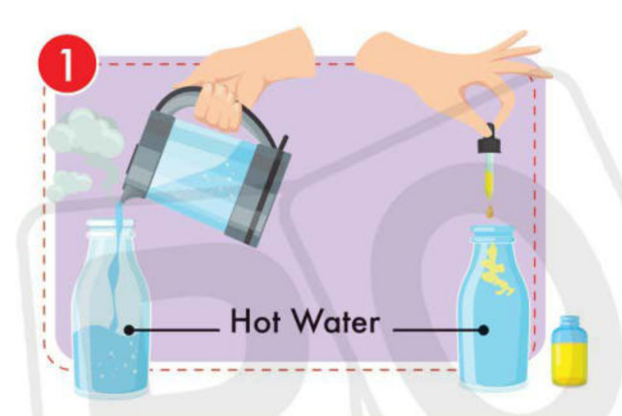


3. Hot and cold water



4. Playing card

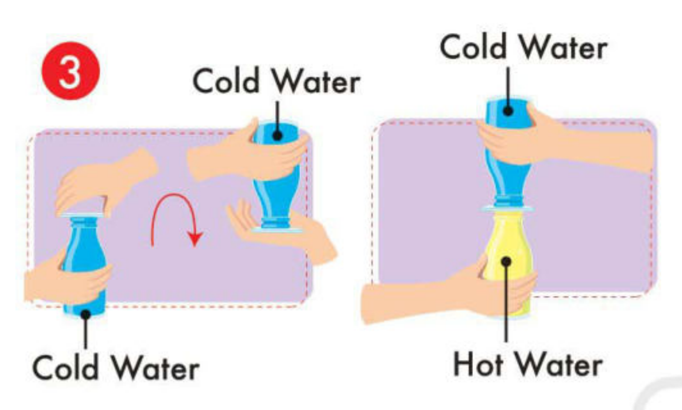
Steps - Part 1



- Fill the first jar with hot water, and then add three drops of the yellow food coloring.



- Fill the second jar with cold water, and then add three drops of the blue food coloring.



- Cover the cold jar with the card and invert it over the hot jar.

4

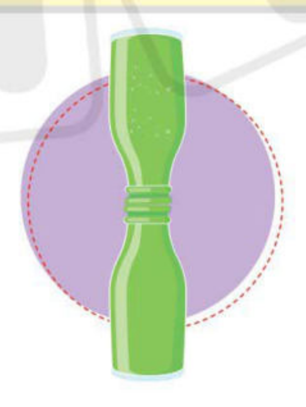
Cold Water

Hot Water

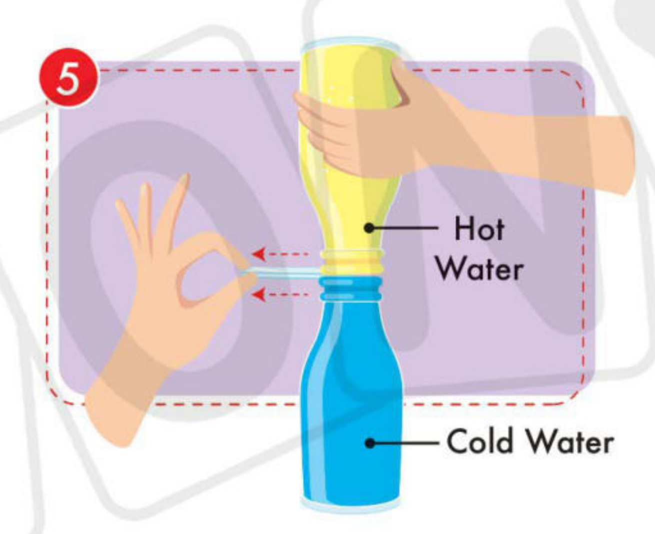
- Gently remove the card and observe what will happen.

Observation:

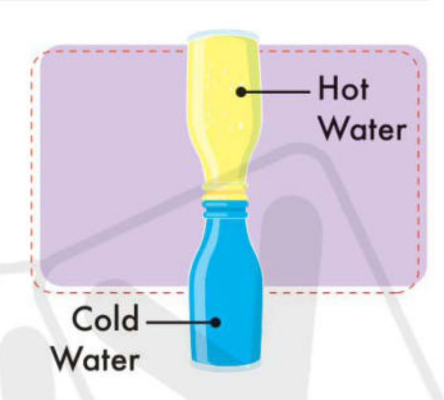
- The yellow and blue water mix, resulting in the formation of the green color.



Steps - Part 2



- Repeat the experiment with the cold water on the bottom and the hot water on the top, then observe the difference.



Observation:

- The yellow and blue water do not mix.

Conclusion:

- Convection currents are the result of mixing hot water with cold water, in which:
  - Hot water is less dense, so it rises.
  - Cold water is more dense, so it sinks.

NOTE:

Convection currents happen in the atmosphere, water, and Earth's mantle.

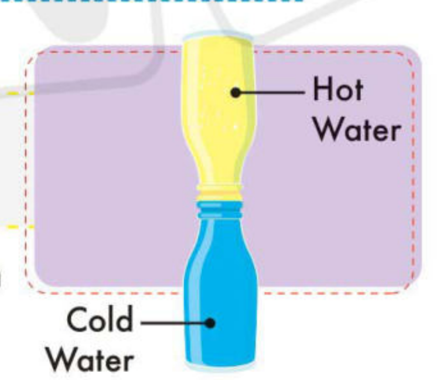
What happens when:

1 The jar containing blue cold water is placed on top of the jar of yellow hot water?



- The yellow and blue water are mixed, resulting in the formation of the green color due to convection currents.

2 The jar of yellow hot water was placed on top of the jar of blue cold water?



- The colors aren't mixed because convection currents will not happen.



- The colors are mixed when the jar containing blue cold water is placed on top of the jar containing yellow hot water.
  Because yellow hot water (less dense) rises and the blue cold water (more dense) sinks, which causes the two colors to mix, forming a green color.

Check your understanding?

» Put (✓) or (✗):

1. Hot water is denser than cold water. ( )
2. The convection currents happen on the ground only. ( )



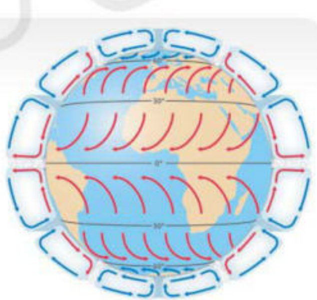
Activity 10 Earth's Wind

Put (✓) or (✗):

1. All parts of Earth don't receive the same amount of solar radiation. ( )
2. Wind doesn't affect the water cycle. ( )



Earth has a global wind system that consists of winds that blow in a constant direction over long periods of time.

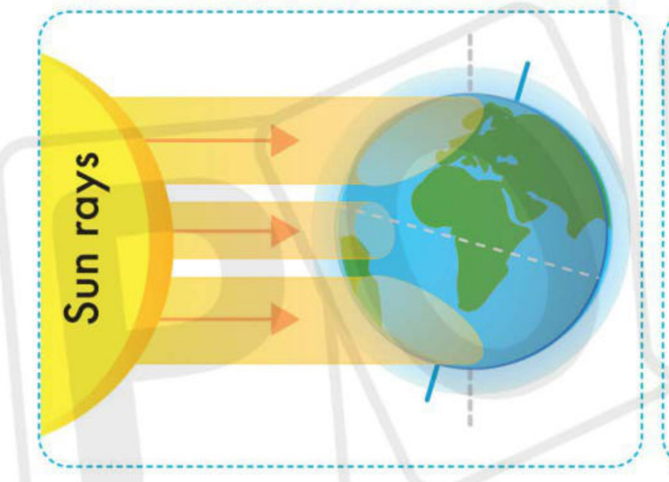


- تمتلك الأرض نظام رياح يشمل الكرة الأرضية كلها ويتكون من رياح تهب في اتجاه ثابت على مدى فترات طويلة من الزمن.

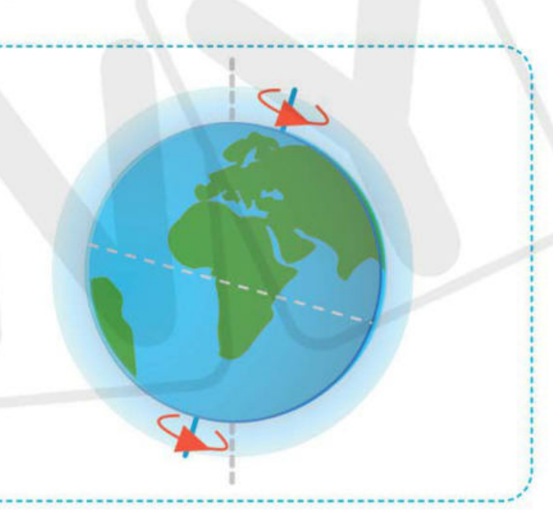
The wind direction is determined by two factors:

The amount of solar radiation the Earth received at different latitudes that causes unequal heating to the Earth's surface

The rotation of Earth

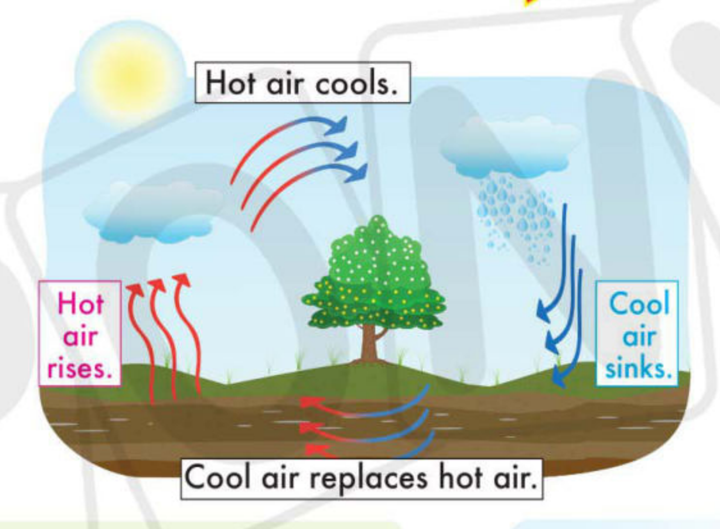


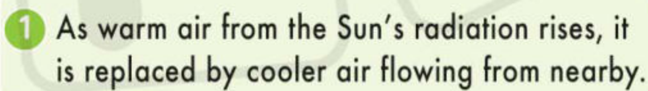
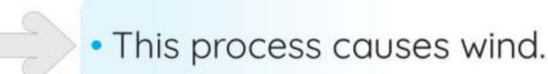
كمية الإشعاع الشمسي الذي يصل إلى الأرض عند دوائر عرض مختلفة يسبب التسخين غير المتساوي لسطح الأرض.



دوران الأرض

How does wind form?



1. As warm air from the Sun's radiation rises, it is replaced by cooler air flowing from nearby. → • This process causes wind.
2. If the rising warm air contains enough water vapor, → • it loses this water in the form of rain.
3. When warm air flows away from the Earth's surface, → • it cools and descends over time, so it reaches the Earth's surface again.
4. When the air reaches the Earth's surface again, → • the air becomes dry.
5. When the dry air flows again to the same place, → • it forms a band (group) of deserts around the planet.

- يرتفع الهواء الساخن لأعلى بفعل إشعاع الشمس وفي الوقت نفسه، تتدفق الكتل الهوائية الأكثر برودة لتحل محل الهواء الدافئ الصاعد.
- إذا احتوى الهواء الدافئ على كمية كافية من بخار الماء أثناء ارتفاعه، فإنه يفقد هذا الماء على هيئة مطر.
- عندما يتدفق الهواء الدافئ بعيدًا عن مكان تواجده، فإنه يبرد ويهبط ويعود لسطح الأرض.
- عندما يصل الهواء إلى سطح الأرض مرة أخرى، يكون الهواء جافًا.
- عندما يتدفق الهواء مرة أخرى الى نفس المكان يشكل هذا الهواء الجاف مجموعة من الصحاري حول الكوكب.

Check your understanding?

» Put (✓) or (✗):

1. The wind direction is affected by the revolution of the moon around the Earth. (   )
2. When the air is warmed, it descends to reach the ground. (   )



Activity 11 Record Evidence Like a Scientist: Energy Transfer in the Water Cycle





» Now that you have learned about energy transfer in the water cycle, look again at Dropping Water Levels. You first saw these in Wonder.







Question:

» How can you describe Dropping Water Levels now?



My Claim:



» ....

....



Evidence:



» ....

....



Scientific Explanation with Reasoning:

» ....

....

Exercises on Lesson 4

1 Choose the correct answer:

1. When the air particles gain energy, they become .... dense and ....
   a. more - sink b. less - sink c. more - rise d. less - rise
2. Warm air is .... than cold air and it rises, creating convection currents.
   a. more dense b. less dense c. heavier d. more colorful
3. Convection currents occur in all the following, except ....
   a. the atmosphere b. metals c. Earth's mantle d. oceans
4. In the Earth's mantle, when molten magma is cooled, it ....
   a. becomes denser b. evaporates c. expands d. rises
5. Where is solar radiation the most direct?
   a. At the North Pole b. At the South Pole
   c. At the equator d. Both a and b
6. .... is produced when heat from the Sun creates convection currents in the air.
   a. An earthquake b. A volcano c. Wind d. Flood
7. When air is warmed by the Sun's radiation, ...
   a. warm air rises to replace the cooler air
   b. cooler air sinks to replace the warmer air
   c. warm air sinks to replace the cooler air
   d. cooler air rises to replace the warmer air
8. Wind's direction is determined by ....
   a. the rotation of Earth only
   b. the amount of solar radiation the Earth received
   c. the rotation of the moon only d. Both a and b
9. .... is responsible for warming the Earth's surface and creating wind.
   a. The Sun b. The moon c. A volcano d. Earth's equator
10. The dry air in the wind's cycle forms a group of .... around the planet.
    a. oceans b. deserts c. puddles d. streams
11. In the atmosphere, if the rising warm air has enough water vapor, this water is lost in the form of ....
    a. rain b. wind c. a volcano d. a hurricane

12 What causes the air to rise and form wind?

a. The rotation of Earth
b. The movement of ocean currents
c. The cooling of air molecules
d. The warming of air by the Sun's radiation

2 Put (✓) or (✗):

1 Water on Earth exists in only one state. ( )

2 Warm air is less dense than cold air. ( )

3 In convection, both warm and cold particles of a fluid move in the same direction. ( )

4 Convection currents occur due to the difference in temperature between a fluid's particles. ( )

5 Convection currents occur only in gaseous media, such as the atmosphere. ( )

6 All parts of Earth's surface don't receive the same amount of sunlight. ( )

7 Earth's global wind system contains wind that blows in a constant direction over a short period of time. ( )

8 Warm air always replaces cold air. ( )

9 The wind direction is affected by the amount of solar radiation reaching the Earth. ( )

10 Wind affects the climate of different regions around the world. ( )

11 Wind is caused by the movement of cool air replacing warm air that rises due to solar radiation. ( )

12 If the Earth stopped rotating, the wind direction would not be affected. ( )

13 Deserts are formed because dry air descends back to the Earth's surface. ( )

3 Write the scientific term:

1 It is the movement that occurs when hotter materials rise and cooler materials sink. (..................)

2 It's one of the Earth's layers that contains convection currents. (..................)

3 It occurs when warmed air by the Sun is replaced by a cooler nearby air. (..................)

4 Complete the following using the words between the brackets:

(rain – cooled – global wind system – dry – water vapor – warmed – direction)

1. Earth has a .... which consists of winds that blow in a constant .... over long periods of time.
2. If the warm air contains enough .... as it rises, it loses this water in the form of ....
3. When air is ...., it descends down to reach the Earth's surface and becomes ....
4. When water particles are ...., they become less dense.

5 Choose from column (A) what suits it in column (B):

A

Column (A)	Column (B)
1 Earth's rotation	a. is less dense, so it rises.
2 Earth's mantle	b. contains convection currents.
3 Cold air	c. affects the direction of wind.
4 Warm air	d. is more dense, so it descends.

1 .... 2 .... 3 .... 4 ....

B

Column (A)	Column (B)
1 The reason of wind formation is	a. it cools and descends by the time it reaches the Earth's surface again.
2 Wind direction is determined by	b. the air warmed by the Sun's radiation rises, and it is replaced by the cooler air flowing from nearby.
3 When warm air flows away from where it is, ...	c. it forms a group of deserts around the planet.
4 After the dry air flows to the same place again, ...	d. the rotation of Earth.

1 .... 2 .... 3 .... 4 ....

6 Give reasons for:

1. In convection currents, cold air descends and warm air rises.

....

....

2. Solar radiation is responsible for the creation of wind.

....

....

7 What happens if:

1. The amount of the Sun's radiation reaching all parts of the Earth is equal?

....

....

2. Warmed air carrying water vapor rises up in convection currents?

....

....

3. Cooled dry air descends and reaches the Earth's surface?

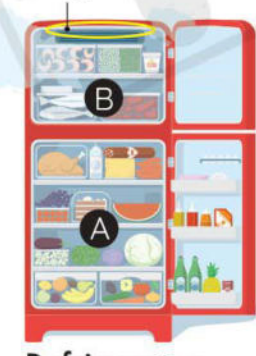
....

4. There's no wind on Earth?

....

8 Study the following figure, then put (✓) or (✗):

1. The air in area (B) is cooled and descends as it becomes more dense. ( )
2. The air in area (A) replaces the air in area (B). ( )
3. When you put the cooling unit at the bottom of the refrigerator, heat won't transfer by convection. ( )

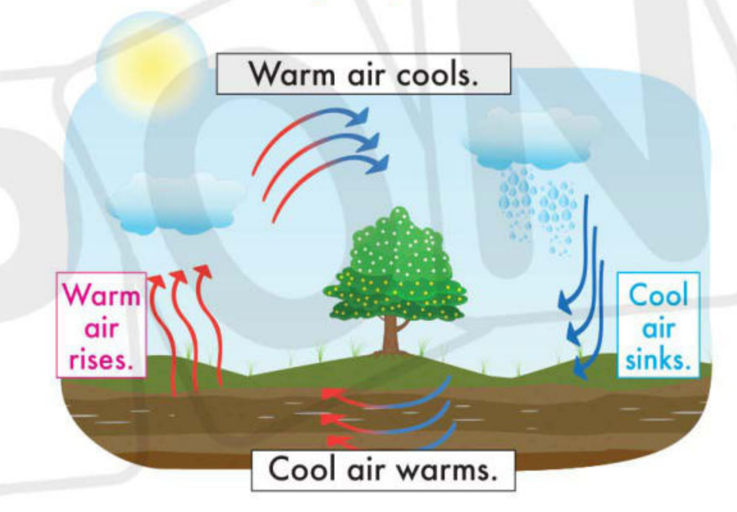


Refrigerator



9 Look at the following figure, then put (✓) or (✗):

Earth's global wind system is driven by both solar radiation and the Earth's rotation, and all of the following steps contribute to wind formation.



1. When the warmed air rises, it forms a group of deserts around the planet. ( )
2. When the nearby cooler air replaces the rising air, it causes wind. ( )
3. When the warm air contains enough water vapor as it rises, it loses it in the form of rain. ( )

Model Exam 1

Question 1

(A) Choose the correct answer:

1. Water on Earth exists in .... different states.
   a. two   b. three   c. four   d. five
2. All the following processes require absorbing heat energy, except for the .... process.
   a. evaporation   b. condensation   c. melting   d. transpiration
3. Convection currents are created because .... heats the Earth unevenly.
   a. the moon   b. wind   c. the ocean   d. the Sun
4. The heat of the Sun reaches the Earth by ....
   a. convection   b. radiation   c. condensation   d. conduction

(B) Write the scientific term:

It is the process by which water droplets in clouds return to the Earth's surface as sleet or hail.

Question 2

(A) Put (✓) or (✗):

1. The water cycle doesn't occur in the desert habitat. ( )
2. Deserts have too little rainfall, as they exist near the equator. ( )
3. Wind affects the climate of different regions around the world. ( )
4. A salt lake in Turkey has hosted colonies of flamingos in cold weather. ( )

(B) Cross out the odd word:

Run off – Photosynthesis – Evaporation – Collection (..............)

Question 3

(A) Choose from column (A) what suits it in column (B):

(A)	(B)
1 Gravity	a. affects the wind direction.
2 Earth's rotation	b. is the force that pulls the rain down.
3 Condensation	c. is a form of evaporation that takes place in plants.
4 Transpiration	d. is the opposite process of evaporation.

(B) What happens if:

You go away from the equator? (According to the temperature)

Model Exam 2

Question 1

(A) Choose the correct answer:

1. All the following are considered forms of precipitation, except ....
   a. sleet b. hail c. lakes d. snow
2. What is the correct sequence of processes that the water undergoes in the water cycle?
   a. Evaporation, precipitation, condensation
   b. Evaporation, condensation, precipitation
   c. Evaporation, precipitation, condensation
   d. Condensation, evaporation, precipitation
3. The presence of all the following in the air help in the formation of clouds, except ....
   a. pollens b. smoke particles c. dust particle d. rocks
4. Heat transfers by convection currents in ....
   a. fluids b. metals c. solids d. space

(B) Give a reason for: Solar radiation is responsible for the creation of wind.

Question 2

(A) Put (✓) or (✗):

1. The water cycle has a start point and also an end point. ( )
2. About 10% of the water in the air is produced from the transpiration process. ( )
3. Cold water is denser than hot water. ( )
4. Wind affects the climate of different regions around the world. ( )

(B) What happens to:

The water level in a puddle when the precipitation on it increases?

Question 3

(A) Complete the sentences using the words between the brackets:

(temperatures – living organisms – Soil – condenses)

1. .... and .... are considered water reservoirs.
2. Gases with different .... have different densities.
3. Water falls to the Earth as rain after water vapor .... into the clouds.

(B) Write the scientific term:

It is a storage location for water on Earth. (........)



Concept 2

Heat and Weather Changes

Concept Objectives:

By the end of this concept, students will be able to:

- Gather and analyze data to describe patterns in heating of air, land, and water and to predict the effects on weather and climate in local and global environments.
- Synthesize information to explain how the physical properties of the atmosphere vary and use these explanations to predict how the weather can change in response to the effects of changes in thermal energy.
- Analyze data to develop models that describe and predict how the motions and interactions of air masses result in changes in weather conditions.

Key Vocabulary:

- Atmospheric pressure
- Anemometer
- Barometer
- Humidity
- Meteorology
- Radar
- Rain gauge
- Rain shadow
- Satellite

Concept 2

Heat and Weather Changes

Lesson 1	
Activity 1	Can You Explain?
Activity 2	Farming the Desert
Activity 3	What Do You Already Know About Weather Changes?

Lesson 2	
Activity 4	Meteorology: The Science of Predicting Weather
Activity 5	Hands-On Investigation: The Unequal Heating of Earth

Lesson 3	
Activity 6	Hands-On Investigation: Spinning Paper Spiral
Activity 7	Tools for Forecasting

Lesson 4	
Activity 8	Extreme Weather: Floods and Sandstorms
Activity 9	Circle Back: Heat and Weather Changes

Lesson 1



Activity 1 Can You Explain?



Warm up



Put (✓) or (✗):

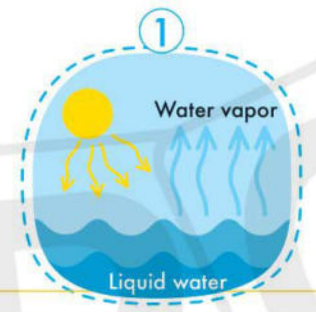
1. Clear skies can quickly turn cloudy and rainy throughout the day.(   )
2. Precipitation is the main way that water returns to Earth from the atmosphere. (   )

The weather may change throughout the day from clear and sunny to cloudy and rainy.



Patterns that cause the change in weather:

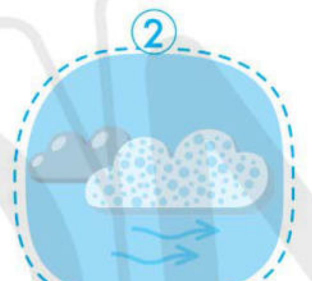
1.



When dense, cold air meets lighter, warm and moist air, the warm air rises.

عندما يلتقى الهواء البارد الأكثر كثافة بالهواء الدافئ الرطب الأقل كثافة، يرتفع الهواء الدافئ.

2.



As moist, warm air rises, it is cooled and condensed forming clouds.

عندما يرتفع الهواء الدافئ الرطب، فإنه يبرد ويتكثف مكونًا السحب.

3.



Water droplets in clouds become larger and denser, so they fall in the form of rain.

تصبح قطرات الماء في السحب أكبر وأكثر كثافة، فتتساقط على شكل أمطار.

Meteorology

It is the science of studying and predicting the weather.

علم الأرصاد الجوية: هو علم الطقس وكيفية التنبؤ به.



Meteorologist

He/She is a scientist who uses different tools to study and forecast the weather.

خبير الأرصاد الجوية: هو/هي عالم يستخدم مجموعة متنوعة من الأدوات لدراسة الطقس التنبؤ به.



Meteorologists predict the weather by:

1. They depend on tools to collect data to study patterns of weather such as temperature, rainfall, and wind over a long period of time.
2. They use these data to predict the weather conditions.

كيف يتنبأ خبير الأرصاد الجوية بأحوال الطقس؟

1. يعتمد خبراء الأرصاد الجوية على أدوات لجمع البيانات ودراسة أنماط الطقس على مدى فترات طويلة من الزمن.
2. يستفيد خبراء الأرصاد الجوية من هذه المعلومات لمساعدتهم على التنبؤ بأحوال الطقس.

Check your understanding?

Put (✓) or (✗):

1. When warm-moist air rises, it forms clouds. (   )
2. Meteorologists are scientists who study meteorites in space. (   )





Activity 2 Farming the Desert

Population growth pushes more people to settle on desert land.

يدفع النمو السكاني الكثير من الناس إلى الاستقرار في الأراضي الصحراوية.



- Farmers face a particular challenge in deserts.
Because more water evaporates than falls by precipitation.



Properties of the Desert Biome

Climate:

Hot and dry or arid.

Rainfall:

The desert has the least amount of rain compared to other biomes.

Deserts receive about 250 millimeters of rain per year.

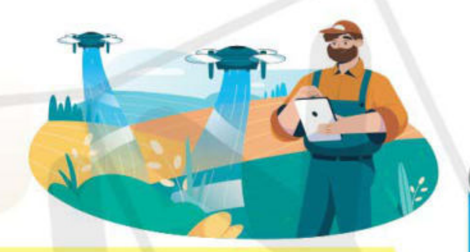


» Farmers have had to adapt by developing highly water-efficient farming practices that focus on getting the maximum benefit of water in deserts.

- بسبب ظروف المناخ القاسي في الصحراء يحاول المزارعون التكيف مع هذا المناخ والعمل على تطوير أساليب الزراعة بغرض "الاستفادة القصوى من المياه".

Farmers come up with innovative ways to make the dry desert soil fertile and fruitful:

يستخدم المزارعون طرقًا مبتكرة لجعل التربة الصحراوية الجافة خصبة ومثمرة.



Innovative ways to make the dry desert soil fertile and fruitful:

1 Crops



Farmers grow specific crops

That are able to withstand the heat and low-fertility soil.

2 Water





Irrigating crops by reusing water and improving soil quality.

To overcome the little rain.

3 Energy





Powering farms with solar energy from wind turbines.

To take advantage of wind and sun conditions.

1. الاهتمام بزراعة المحاصيل التي تتحمل حرارة الطقس والتربة منخفضة الخصوبة.
2. استخدام طرق جديدة لري المحاصيل، مثل إعادة استخدام الماء وتحسين جودة التربة.
3. الاستفادة من الرياح والشمس باستخدام الطاقة الشمسية أو توربينات الرياح في تشغيل المزارع الصحراوية.

Check your understanding?

Study the following pictures, then put (✓) or (✗):



Desert biome



Rainforest biome

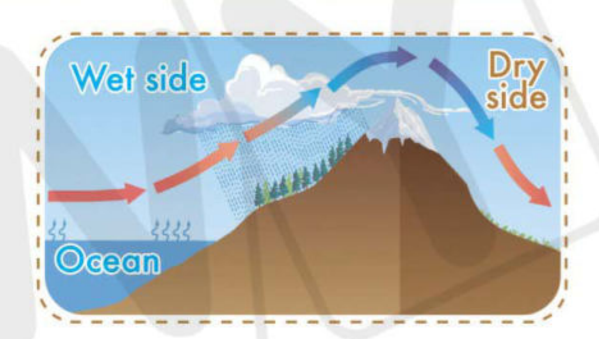
1. The two biomes receive the same amount of rain throughout the year. (   )
2. Farming in the desert is difficult because it has a wet climate. (   )

Activity  3 What Do You Already Know About Weather Patterns?

» Look at the opposite picture, then answer:

Do both sides of the mountains have the same amount of rain?

☐ Yes ☐ No 



Mountain Effect

Mountain ranges often have two sides:

1. A wet side has rainy weather, which is called the "windward side"

2. A dry side "rain shadow side" has too little rainfall which is called the "leeward side"

Wind direction

Rain shadow

Mountain range

Forests "more vegetation"

Deserts "less vegetation"

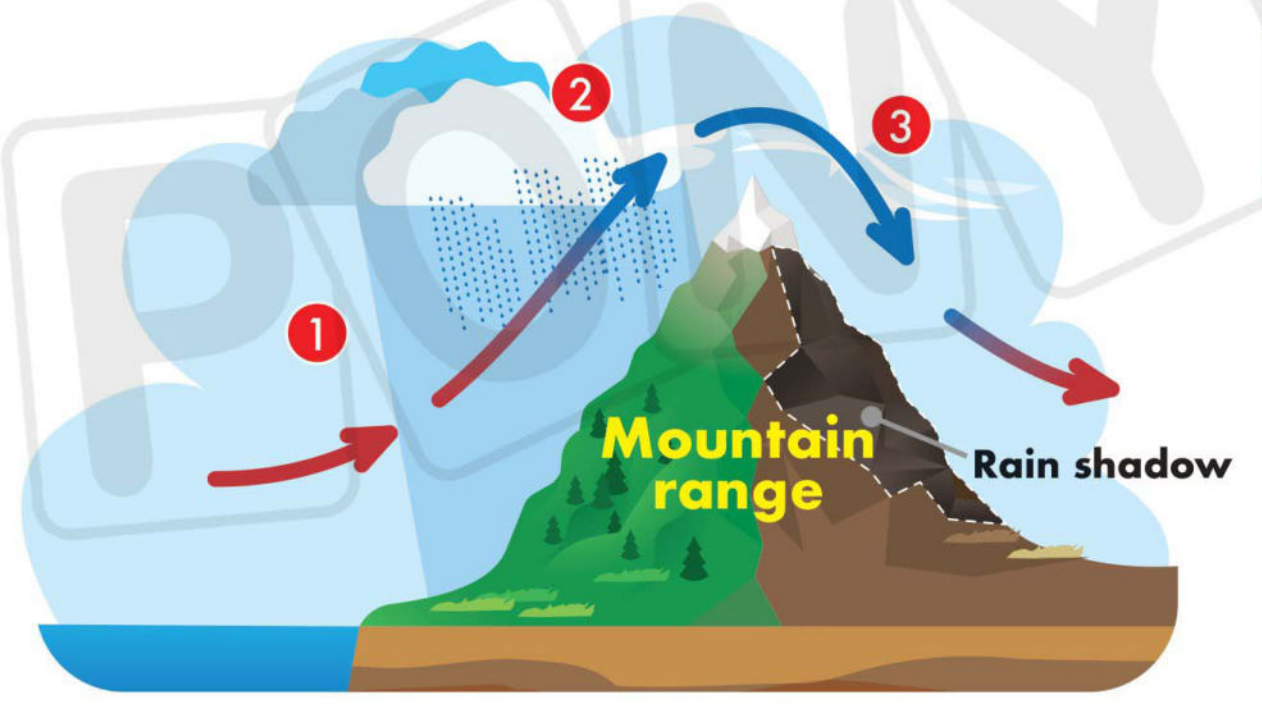
Ocean

Rain Shadow:

An area on the dry side of a mountain range where rainfall is reduced.

ظل المطر: منطقة على الجانب الجاف من سلسلة الجبال حيث يقل هطول الأمطار.

How is the rain shadow formed?



Rain shadow formation

1. When humid air encounters a mountain range, it rises.
2. The humid air cools, so water vapor condenses, then precipitates.
3. The air descends and becomes warm, so it dries the land on the other side of the mountain.

كيف تحدث ظاهرة ظل المطر:

1. تجبر الجبال الهواء الرطب على الصعود إلى أعلى.
2. يبرد الهواء ويتكثف بخار الماء وتهطل الأمطار .
3. عندما تهبط هذه الرياح في الجهة المعاكسة للجبال يصبح الهواء دافئًا.



– A rain shadow area phenomenon is formed.
Because the mountain blocks the humid air.

Changes in the Atmosphere

- The properties of the atmosphere are different from those at the top of a mountain to those at the bottom of the mountain, where:
- As the elevation from the sea level increases, all the following decrease:

Temperature	Atmospheric pressure	Air density

Temperature decreases.
Air density decreases.
So, atmospheric pressure decreases.

At the top of a mountain, there is:
- Low atmospheric pressure
- Low temperature
- Low air density

At the bottom of a mountain, there is:
- High atmospheric pressure
- High temperature
- High air density

Atmospheric Pressure:

It is the weight of the air column above a location.

الضغط الجوي: هو وزن عمود الهواء فوق هذه المنطقة.

Air force
Air column

Atmospheric pressure is the amount of force that air exerts on its surroundings.

الضغط الجوى هو مقدار القوة التي يؤثر بها الهواء على البيئة المحيطة.

NOTE:

- Heavy gases are found at the bottom of a mountain, while lighter gases are found at the top of a mountain.

Exercises on Lesson 1

1 Choose the correct answer:

1. Warm, moist air ...., when it meets cold air because it is .... dense.
   a. rises, more b. descends, more
   c. rises, less d. descends, less
2. Warm, moist air condenses at high elevations due to ....
   a. high temperatures b. low tempertures
   c. high atmospheric pressure d. sunlight
3. The .... is the biome that receives the least amount of rainfall per year.
   a. tropical rainforest b. grassland
   c. temperate forest d. desert
4. Farmers take advantage of .... energies to power farms in the desert.
   a. solar and wind b. wind and sound
   c. wind and chemical d. solar and sound
5. A/An .... phenomenon is formed due to blocking the humid air by a mountain range.
   a. aurora b. rain shadow c. rainbow d. light reflection
6. A .... is the landform that causes the rain shadow phenomenon.
   a. lake b. plain c. mountain d. valley
7. A rain shadow is formed on the .... side of a mountain as a result of .... precipitation there.
   a. wet, more b. dry, less c. wet, less d. dry, more
8. On the dry side of the mountains, you might find ....
   a. more rainfall b. a desert
   c. more evaporation d. more plants
9. If the temperature at the top of a mountain is 18 °C, so the temperature at its bottom might be ....
   a. 18 °C b. 0 °C c. 10 °C d. 25 °C

10 As a hiker goes up to the top of a mountain, all the following occur, except that ....

a. the atmospheric pressure decreases
b. the temperature decreases
c. the atmospheric pressure increases
d. the air density decreases

11 It is hard to breathe on the top of the mountain due to the ....

a. increased percentage of oxygen
b. high density of air
c. high temperature
d. lower density of air

12 The atmospheric pressure at 4 km above sea level is higher than that at ....

a. 2 km b. 6 km c. 3 km d. 1 km

13 .... they are scientists who study weather.

a. Cell biologists b. Meteorologists
c. Zoologists d. Ecologists

14 Meteorology is the science of studying the ....

a. soil b. Earth c. plants d. weather

15 On the top of a mountain, the atmospheric pressure is .... that at the bottom of the mountain.

a. higher than b. less than
c. equal to d. double

16 .... is the weight of the air column above a specific area.

a. Temperature b. Mass
c. Atmospheric pressure d. Gravity

2 Put (✓) or (✗):

1 When water droplets in clouds become larger and denser, they evaporate. ( )

2 Desert is characterized by a hot and rainy climate. ( )

3. Population growth pushes more people to settle on desert land. (   )
4. Farmers grow crops that can withstand the low temperature. (   )
5. In deserts, the amount of water that evaporates is greater than the amount that falls by precipitation. (   )
6. Farming is difficult in desert biomes. (   )
7. The desert receives about 350 millimeters of rain per year. (   )
8. The rainfall on the windward side of a mountain range is less than that on the leeward side. (   )
9. Warm air can carry more water vapor than cool air. (   )
10. The rain shadow phenomenon occurs when dry air hits a mountain. (   )
11. If you go up a mountain, atmospheric pressure decreases as the weight of the air column decreases. (   )
12. When an airplane goes to a lower altitude, the atmospheric pressure affecting it decreases. (   )
13. Atmospheric pressure doesn't change by increasing the altitude above sea level. (   )

3 Write the scientific term:

1. They are scientists who use different tools to study and forecast the weather. (..........)
2. It is considered the driest biome on Earth. (..........)
3. An area on the dry side of a mountain range where rainfall is reduced. (..........)
4. It is the science that studies and predicts the weather. (..........)
5. It is a phenomenon results when one side of a mountain has heavy rain and the other side becomes dry. (..........)
6. It is the amount of force that air exerts on its surroundings. (..........)

4 Complete the following using the words between the brackets:

(fertile – Meteorologists – rain shadow - precipitates - increases - fruitful – humid air - decreases - condenses)

1. .... depend on tools to collect data to study patterns of weather over a long period of time.
2. Farmers use innovative ways to make the dry desert soil .... and ....
3. When humid air cools, it .... then ....
4. A .... is formed when a mountain range blocks the .... coming from a nearby ocean.
5. During climbing a mountain, atmospheric pressure ...., while air density .... when we go down.

5 Correct the underlined words:

1. The climate of the desert is <u>cold and rainy</u>. (..................)
2. Farmers grow crops that are able to withstand the <u>low</u> temperature. (..................)
3. In deserts, <u>less</u> water evaporates than falls through precipitation. (..................)
4. The gases that lie at the bottom of a mountain are <u>lighter</u> than those at its top. (..................)
5. A forest may exist on the <u>dry</u> side of a mountain. (..................)

6 Cross out the odd word:

1. Desert – Rainforest – Climate – Grassland (..................)
2. Less rainfall – Dry air – More precipitation – Less Plants (..................)
3. Wet side – Dry side – Humid air – Heavy rain (..................)

7 Choose from column (A) what suits it in column (B):

Column (A)	Column (B)
1 Wind turbines	a. the atmospheric pressure is low.
2 At the top of a mountain	b. the air density is high.
3 Desert	c. are used to power farms in deserts.
4 At the bottom of a mountain	d. has arid climate and low-fertility soil.
5 Water is reused to	e. irrigate crops to overcome a little rain in deserts.

1 .... 2 .... 3 .... 4 .... 5 ....

8 Give reasons for:

1. The desert is considered the driest biome in the whole world.

   ....

2. Farming is difficult in desert biomes.

   ....

3. The mountains' ranges cause the rain shadow effect.

   ....

4. The rain shadow contains fewer plants than the wet side of the mountain.

   ....

5. There might be snow on the top of a mountain.

   ....

9 What happens to:

1. Warm, humid air when it rises up?

   ....

2. Atmospheric pressure when climbing up a mountain?

   ....

3. The temperature when descending from the top of the mountain?

   ....

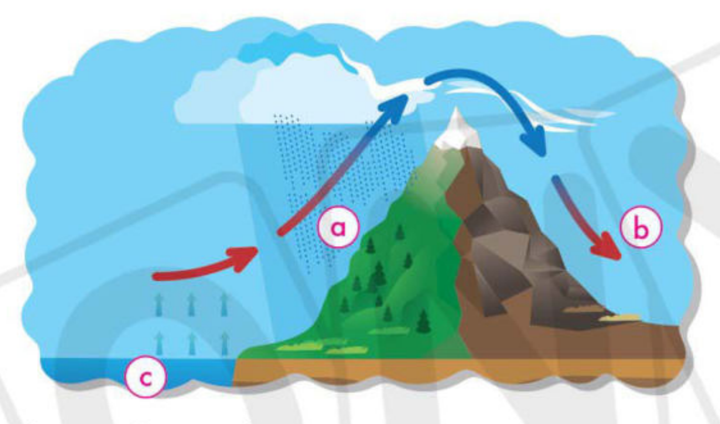
Unit 3

10 Study the following figure, then put (✓) or (✗) :



1. The atmospheric pressure at point "A" is lower than that at point "B". ( )
2. The person at point "A" is feeling colder than the person at point" B". ( )
3. The number of molecules of gases at point "A" is greater than that at point "B". ( )
4. Air at point "A" has the same density as air at point "B". ( )

11 Study the following figure, then choose the correct answer:



1. The rain shadow is formed in area .... (a - b - c)
2. There's more water vapor in area .... (a - b)
3. The landform in the area "c" may be .... (a plain – an ocean)
4. The area "a" is called the .... of the mountain. (wet side – dry side)
5. There's might be a .... in the area "a". (desert – forest)

Lesson 2



Activity  Meteorology: The Science of Predicting Weather

» Put (✓) or (✗):

1. Predicting weather is done all over the world. ( )
2. Technology has helped in the evolution of predicting wetter conditions. ( )



What is the difference between weather and climate?

Climate	Weather
Climate is the average weather condition over an extended period of time.	Weather is the atmospheric condition in a specific place over a short period of time.
Example: Winter in Egypt is generally moderate.	**Example:** Today in Alexandria, the temperature is 16 °C at the daytime.

The Science of Predicting Weather:

- People studied and predicted weather well before there were televisions.
- درس الإنسان وتوقع أحوال الطقس منذ زمن طويل حتى قبل اختراع التلفزيون.

- Meteorologists predict and forecast weather through different stages.
- يقوم خبراء الأرصاد بتوقع ودراسة الطقس من خلال عدة مراحل، وهي:

 Gathering Data → 2 Analyzing Data →  Put It all Together

1 Gathering (Collecting) data about weather:

Meteorologists gather data by using different instruments to predict the weather conditions.



① **Meteorologists try to collect as much data as they can about**

- air temperature
- atmospheric pressure
- wind
- precipitation
- other conditions

» To ensure that they have a complete understanding of the weather.

- Meteorologists collect as much data as possible about weather through wide areas, different altitudes, and different time periods to:
  1. Understand how the weather is changing.
  2. Predict what weather conditions may be in the near future.

يقوم خبراء الأرصاد الجوية بجمع أكبر قدر من البيانات عن الطقس التي تغطي مساحات واسعة وارتفاعات مختلفة وعلى فترات زمنية مختلفة وذلك لـ:

1. فهم الأحوال الجوية وكيفية تغير الطقس.
2. التنبؤ بالظروف الجوية في المستقبل القريب.

Wide areas and different altitudes are areas from the ground to a high area in the atmosphere.

Instruments can be divided into three types according to their function:



A Measurement Tools

They are designed to measure specific conditions in the atmosphere in different locations.

Thermometer

is used to measure the temperature.



Barometer

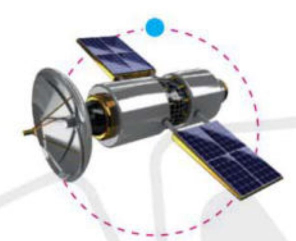
is used to measure the atmospheric pressure.

B Carrying Measurement Tools

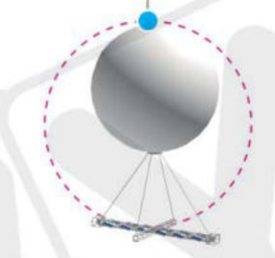
They are designed to carry measurement tools up high in the atmosphere to measure weather conditions at different altitudes.



Airplanes



Satellites



Weather Balloons



C Data Transmission Tools

They are designed to transmit data to scientists to collect and analyze it.



Weather Station

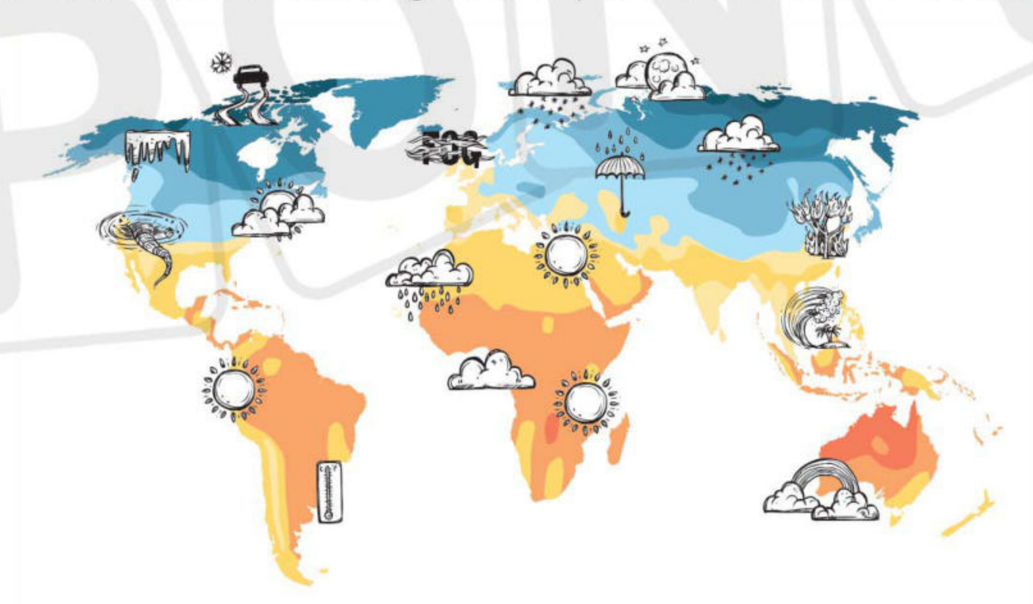


Satellite

2 Analyzing Data:

Meteorologists compile data from different places and over periods of time so that they can analyze it.

» One of the most useful ways to compile **weather data** is on a map.



Meteorologists map weather data like air temperature, atmospheric pressure, and humidity onto maps to:

يقوم خبراء الأرصاد الجوية برسم بيانات الطقس مثل درجة حرارة الهواء وضغط الهواء والرطوبة على الخرائط من أجل:

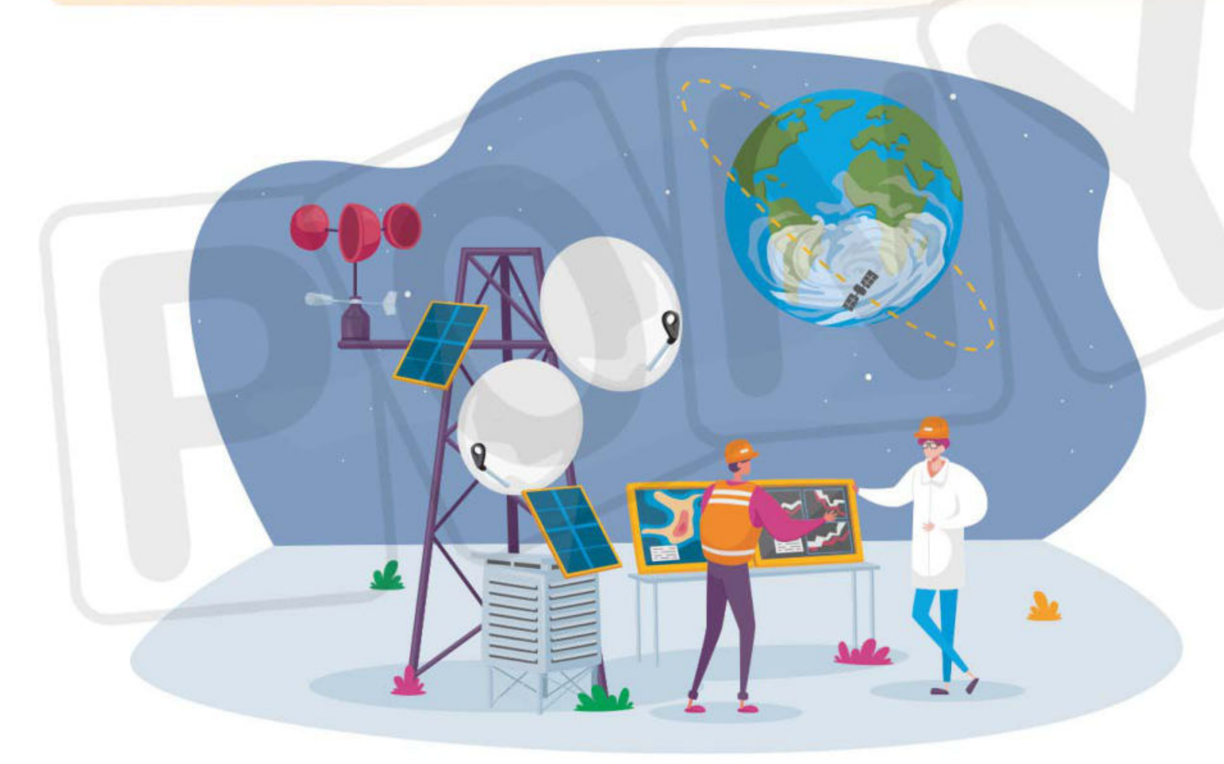
- identify weather patterns.
  - تحديد أنماط الطقس.
- identify air masses and track how they are moving and interacting with each other.
  - تحديد كيف تتحرك وتتفاعل كتل الهواء مع بعضها.
- communicate information to other meteorologists and the public.
  - إرسال المعلومات إلى خبراء الأرصاد الجوية الآخرين والجمهور.

Humidity It is a measure of how much water vapor is present in the air.

الرطوبة: هي مقياس لكمية بخار الماء الموجود في الهواء.



3 Putting It all Together:



Meteorologists collect and analyze current data:

- Meteorologists consider collecting and analyzing current data about the atmosphere to be just one part of prediction.

• يعتبر خبراء الأرصاد الجوية أن جمع وتحليل البيانات الحالية حول الغلاف الجوي هو مجرد جزء من التنبؤ بالطقس.

Meteorologists apply what they know:

- They also need to apply what they know about how other factors, such as landforms, affect the atmosphere.

• يحتاج علماء الأرصاد الجوية أيضًا إلى تطبيق ما يعرفونه عن كيفية تأثير العوامل الأخرى، مثل التضاريس على الغلاف الجوي.

Meteorologists use complex computer models:

- Nowadays, meteorologists use complex computer models to predict how different factors will interact.

• اليوم، يستخدم علماء الأرصاد الجوية نماذج حاسوبية معقدة للتنبؤ بكيفية تفاعل العوامل المختلفة.

Uncertainty in the Weather

- Weather forecasts can be uncertain, especially when it comes to forecasting weather conditions in the coming days or weeks.
- Small, unexpected changes in wind, air, ocean temperature, or humidity in the air can affect weather.

• قد تكون التنبؤات عن أحوال الطقس غير مؤكدة، خاصة فيما يتعلق بالتنبؤ بأحوال الطقس خلال أيام أو أسابيع قادمة.
• يمكن للتغيرات الصغيرة غير المتوقعة في درجة حرارة الرياح، أو الهواء، أو المحيط، أو الرطوبة في الهواء: أن تؤثر في أحوال طقس الأسبوع المقبل بدرجة كبيرة.

Probability

Next week's weather conditions are very high, as it is sometimes said that there is a 40 percent chance of rain.





– Weather events are nearly impossible to predict.
Because sometimes conditions change so quickly and unpredictably.


• قد تتغير الظروف بسرعة كبيرة، وبشكل غير متوقع بحيث يكاد يكون من المستحيل التنبؤ بأحوال الطقس.





Check your understanding?

Put (✓) or (✗):

1. Meteorologist uses thermometer to measure temperature.( )
2. Humidity is a measure of how much oxygen is present in the air. ( )




Activity 5 Hands-On Investigation: The Unequal Heating of Earth

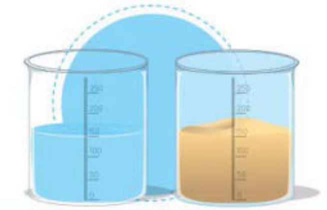
Put (✓) or (✗):

1. The amount of solar radiation that reaches all regions on Earth's surface is equal. ( )
2. Warm air is heavier than cold air. ( )

Experiment

In this experiment, you will investigate the differences in the effects of thermal energy on a container of sand and a container of water.

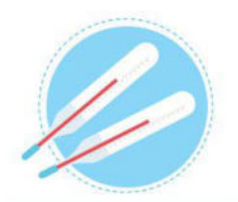
Tools:



Two beakers: one contains 150 mL of sand, and the other contains 150 mL of water.

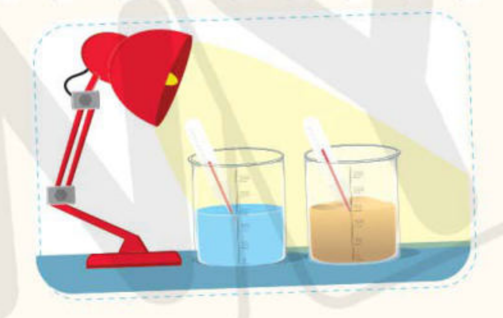


A light bulb



Two thermometers

Steps:



1. Place the beakers next to each other.
2. Place a thermometer in each beaker and record the starting temperature.
3. Place a lamp 10 cm above both beakers.
4. Turn off the light bulb and record the temperature of each beaker after 10 minutes.
5. Turn on the light bulb and record the temperature of each beaker after 10 minutes.

Results:

	Starting Temperature	Light Bulb on (Simulating Daylight)	Light Bulb off (Simulating Night)
Temperature of Sand	35°C	40°C	35°C
Temperature of Water	35°C	38°C	36°C

Observation:

- Sand heats up faster than water.
- Sand cools faster than water.

Conclusion:

- The solar radiation has a different effect on water and land on Earth's surface, which leads to differences in the temperatures of air masses in a specific region.

	Day Temperature	Night Temperature
Coastal Regions	Moderate temperature (because water heats up slowly)	Moderate temperature (because water cools slowly)
Desert Regions	High temperature (because sand heats up quickly)	Low temperature (because sand cools quickly)



- Sand on the beach is warmer than the sea's water during the day, while sand is colder at night.

Because sand heats up and cools faster than water.

NOTE:

- The Earth has many different surfaces, and the soil is made up of a mixture of different things, such as rocks, soil, clay, and water, not just sand.

Exercises on Lesson 2

1 Choose the correct answer:

1. .... is the first step that meteorologists take to forecast weather.
   a. Analyzing data b. Collecting data
   c. Mapping data d. Transmitting data
2. All the following are from the data collected by meteorologists to forecast today's weather, except the ....
   b. temperature b. atmospheric pressure
   c. type of soil d. precipitation
3. Meteorologists use barometers to measure ....
   a. temperature b. atmospheric pressure
   c. humidity d. mass
4. The temperature of the air is measured by the ....
   a. thermometer b. barometer c. anemometer d. rain gauge
5. All the following are used to carry measurement tools high in the atmosphere, except ....
   a. satellites b. airplanes
   c. weather balloons d. barometer
6. A .... can carry weather measurement tools and also transmit weather data.
   a. barometer b. weather station
   c. thermometer d. satellite
7. The amount of water vapor found in air is called ....
   a. humidity b. evaporation c. condensation d. cloud
8. Putting data on a weather map represents .... for weather prediction.
   a. gathering data b. collecting data
   c. analyzing data d. putting it all together
9. Applying what meteorologists know about the effects of different landforms on weather is called ....
   a. mapping data b. collecting data
   c. analyzing data d. putting it all together.

10 .... cools faster at night.

a. A sea b. A river c. A desert d. An ocean

11 .... is the slowest material that heats up.

a. Sand b. A rock c. Soil d. Water

12 Which statement is correct?

a. Water heats up faster than sand.

b. Water needs less energy than sand to heat up.

c. Sand heats up slower than water.

d. Sand needs less energy than water to heat up.

13 Oceans help improve the world's climate through ....

a. heat absorption b. nitrogen gas absorption

c. salt storage d. Water storage

2 Put (✓) or (✗):

1 People studied and predicted weather well before there were televisions. ( )

2 Small and unexpected changes in wind or moisture in the air cannot affect next week's weather. ( )

3 Technology has no role in the evolution of predicting weather conditions.

4 Meteorologists obtain weather measurements from television. ( )

5 Meteorologists collect data about weather conditions after analyzing them. ( )

6 Thermometer is used to carry weather instruments up high in the atmosphere. ( )

7 The force exerted by air on the surrounding area is measured by a thermometer. ( )

8 By increasing the amount of water vapor in air, humidity decreases. ( )

9 Weather balloons are designed to carry measurement tools to the ocean's floor. ( )

10 Today, meteorologists use complex computer models to predict weather. ( )

11 Forecast can be 100% certain about the predicted weather for the next week. ( )

12 Sea water and the sand on its beach usually have the same temperature. ( )

13 Sand on Earth's surface heats up faster than water. ( )

14 Coastal regions have moderate weather. ( )

15 The soil contains only sand. ( )

3 Write the scientific term:

1 It is the average weather condition over an extended period of time. (..........)

2 It is the final stage in the weather prediction process. (..........)

3 It is the tool used by meteorologists to measure atmospheric pressure (..........)

4 It is the instrument used to measure the air temperature. (..........)

5 It is a measure of how much water vapor is present in the air. (..........)

6 It is composed of a mixture of sand, rocks, water and clay. (..........)

4 Complete the following using the words between the brackets:

(more – Weather stations – Landforms – Mapping data – satellites – less)

1 .... and .... contain devices designed to transmit data to meteorologists.

2 .... allows meteorologists to identify air masses and track how they are moving.

3 .... are from the factors that affect the atmosphere.

4 Water stores .... heat energy than the sand.

5 Sand needs .... heat energy than water to heat up.

5 Cross out the odd word:

1 Temperature – Atmospheric pressure – Barometer – Humidity (..........)

2 Weather maps – Barometer – Satellites - Temperature (..........)

3 Satellites – Weather balloons – Thermometer – Airplane (..........)

6 Choose from column (A) what suits it in column (B):

Column (A)	Column (B)
1 Weather stations	a. affect the atmosphere patterns.
2 Landforms	b. transmit weather data to scientists.
3 Computer models	c. is the state of atmosphere in a specific place for a short period of time.
4 Weather	d. are devices used to predict the interaction between factors affecting weather.

1 .... 2 .... 3 .... 4 ....

7 Study the following figures, then complete:


Figure (1)


Figure (2)


Figure (3)


Figure (4)

1. The instrument in figure (..........) is used to measure the temperature.
2. The instrument in figure (..........) is used to measure atmospheric pressure.
3. Figures (..........) and (..........) are used to get weather measurements at high altitudes.
4. Figure (..........) transmits measurements about weather to scientists from space.

8 Study the following figure, then choose the correct answer:



1. Area .... heats up faster. ("A" -"B")
2. If the temperature of area "A" during the day is 30, then the temperature in area "B" might be ....


(30°C - 26°C- 34°C)

3. Area .... requires more energy to heat up.


("A" - "B")

9 Mention one use for all the following:

1. Thermometer

....

2. Barometer

....

10 Give reasons for:

1. Weather balloons are designed to carry measurement tools high in the atmosphere.

....

2. Mapping data about weather is very important.

....

3. Sand on the beach is hotter than the sea water during the day.

....

4. Coastal regions have moderate weather.

....

11 What happens to:

1. The reading of a hiker's barometer when climbing a mountain?

....

2. The reading of a thermometer when you move it from the beach's sand to the sea water at noon?

....

3. Humidity if you move towards a city on the coast?

....

4. The temperature of the beach sand at night?

....

Lesson 3



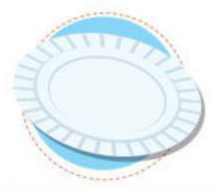
Activity 6 Hands-On Investigation: Spinning Paper Spiral

- Solar energy warms our Earth. But not all places on Earth receive the same amount of sunlight, and not all surfaces absorb the warmth of the Sun equally.
- You have learned that changes in temperature affect the way that air moves.
- When air is heated, it expands as its molecules spread out away from each other.

Experiment

- In this experiment, you will investigate the effect of the temperature on the movement of air particles.

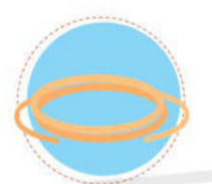
Tools:



Paper plate



Scissors



String



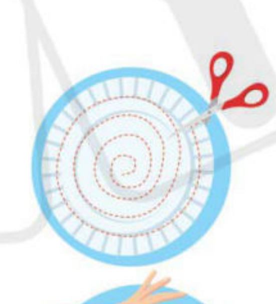
Lamp



Marker

Steps:

1. Use the marker to draw the shape of a spiral on a paper plate.



2. Use the scissors to cut the spiral from the paper plate.
3. Attach a small piece of thread to the center of the paper spiral with a piece of tape.



4. Turn on the lamp. Wait for two minutes.

5. Hold the paper spiral over the lighted lamp.



Observation:

- The paper spiral begins to spin without stopping.

Conclusion:

- The warm air around the paper spiral expands and becomes less dense. So, it moves up, allowing the cooler and denser particles to move downward, creating a convection current that spins the spiral paper continuously.

- يتمدد الهواء الدافئ المحيط بالورقة الحلزونية ويصبح أقل كثافة، لذا يتحرك للأعلى،
- مما يسمح للجزيئات الأكثر برودة والأكثر كثافة بالتحرك نحو الأسفل،
- فيؤدي إلى إنشاء تيار حراري يعمل على تدوير الورقة الحلزونية بشكل مستمر.

	Air Current	Wind
Differences	It is the vertical movement of air. (Warm air rises and cooler air sinks.)	It is the horizontal movement of air from cold regions to warmer regions.
Similarities	Both occur due to the difference in temperature of the air on Earth's surface.	

Enrichment Information:

- Weather phenomena occur in the nearest atmospheric layer to Earth's surface, which is called the "troposphere".

Check your understanding?

Choose the correct answer:

1. On blowing talcum powder over a lamp that is turned off, the powder .... to the top of the lamp. (rises up - falls down)
2. On blowing talcum powder over a lamp that is turned on, the powder .... to the top of the lamp. (rises up - falls down)



Activity 7 Tools for Forecasting



Put (✓) or (✗):

1. Technology can help meteorologists make more accurate predictions. (   )
2. Sometimes weather conditions change so quickly and unexpectedly. (   )

Meteorologists try to collect as much data as they can about:

- Air temperature
- Air pressure
- Wind
- Humidity
- Other conditions

To do this, they use a variety of tools to study and forecast the weather.

1 Anemometer:



- It records the speed of wind blowing.

2 Radar:



- It detects precipitation and helps track thunderstorms and hurricanes.

3 Rain gauge:



- It can record how much precipitation is falling in a given area.

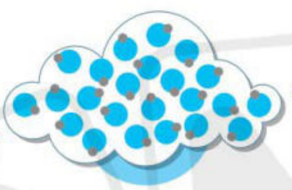
- الأنيمومتر: جهاز يستخدم لتسجيل سرعة هبوب الرياح.
- رادار الطقس: جهاز يستخدم لتحديد حجم و سرعة هطول المطر، ويعمل على تتبع العواصف الرعدية و الأعاصير.
- مقياس المطر: جهاز يستخدم لتسجيل مقدار المطر في منطقة معينة.

NOTES:

- Any changes in atmospheric pressure and wind speed can predict changes in the weather conditions.
- Weather satellite can predict the path of a hurricane.

Precipitation:







1. When small water droplets form in a cloud, the air can carry them away.
2. As water vapor continues to condense, the droplets become larger and heavier.
3. Eventually, gravity pulls them to the ground.



- Snow or ice crystals form when the air in the cloud is cold enough.

Check your understanding?

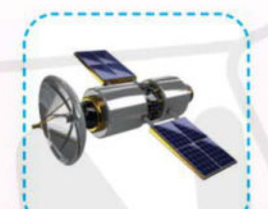
Complete the following table by matching the tool to the meteorologist's goal.



Anemometer



Rain Gauge



Weather Satellite



Barometer

If a meteorologist wants to know	They should use
1 The speed of a tornado's winds.	....
2 Whether it rained more this summer or last summer.	....
3 The possible path of a hurricane.	....
4 The current atmospheric pressure.	....

Exercises on Lesson 3

1 Choose the correct answer:

1 When the air particles are heated, all the following occur, except that ....
a. the air particles expand
b. the air becomes more dense
c. the air becomes less dense
d. the air rises

2 When cold air replaces warm air, ...
a. the wind stops
b. a convection current occurs
c. the wind moves vertically
d. the air current moves horizontally

3 The horizontal movement of air along Earth's surface is called ....
a. air pressure
b. atmosphere
c. wind
d. air current

4 Cold air is .... than warm air, so cold air ....
a. more dense – sinks
b. less dense – rises
c. more dense – rises
d. less dense – sinks

5 Wind is created when ....
a. warm air replaces cold air
b. more dense air replaces less dense air
c. less dense air replaces denser air
d. both air masses are the same temperature

6 Anemometer is used to measure the ....
a. atmospheric pressure
b. wind direction
c. wind speed
d. temperature

7 A weather radar can predict all the following, except ....
a. snow
b. rain
c. hail
d. sunlight

8 The .... measures the amount of precipitation on a city.
a. barometer
b. rain gauge
c. anemometer
d. thermometer

9 .... pulls heavy water droplets in clouds downward.
a. Humidity
b. Gravity
c. Wind
d. Sunlight

10 Snow falls when the air in the clouds becomes .... enough to form ice crystals.
a. warm
b. high in temperature
c. cold
d. hot

11 As the humidity increases, the amount of condensed water in the air ....
a. increases
b. decreases
c. doesn't change
d. disappears

12 .... is the main reason for the occurrence of weather phenomena.

a. The moon
b. The Sun
c. Wind
d. Snow

2 Put (✓) or (✗):

1. All parts on Earth's surface receive the same amount of solar energy. (   )
2. Wind blows from cold regions to warmer regions. (   )
3. Wind is created due to the equal heating of Earth's surface by the Sun. (   )
4. When air is heated, its molecules expand and become less dense. (   )
5. A tornado's wind direction is measured by an anemometer. (   )
6. Weather instruments and technology help meteorologists make accurate weather predictions. (   )
7. Changes in pressure and wind speed can predict changes in the weather. (   )
8. A weather satellite can predict the possible path of a hurricane. (   )
9. Precipitation increases when humidity in the air increases. (   )
10. The paths of both thunderstorms and hurricanes can be tracked by radar. (   )

3 Write the scientific term:

1. It is the horizontal movement of air on Earth's surface. (............)
2. It is the rising and falling of air due to differences in temperature. (............)
3. It is the instrument that is used to measure wind speed. (............)
4. It is the instrument that is used to predict thunderstorms and hurricanes. (............)

4 Complete the following using the words between the brackets:

(weather radar – Wind – Ice crystals – vertically – rain gauge – horizontally)

1. Air currents move ...., while wind moves .... on Earth's surface.

2 .... is created by the unequal heating of Earth's surface.

3 A rainfall can be predicted by a ...., while the amount of rainfall can be measured by a ....

4 .... form if the air in the cloud is cold enough.

5 Cross out the odd word:

Rain gauge – Anemometer – Ruler – Barometer (....................)

6 Study the following figures, then put (✓) or (✗):

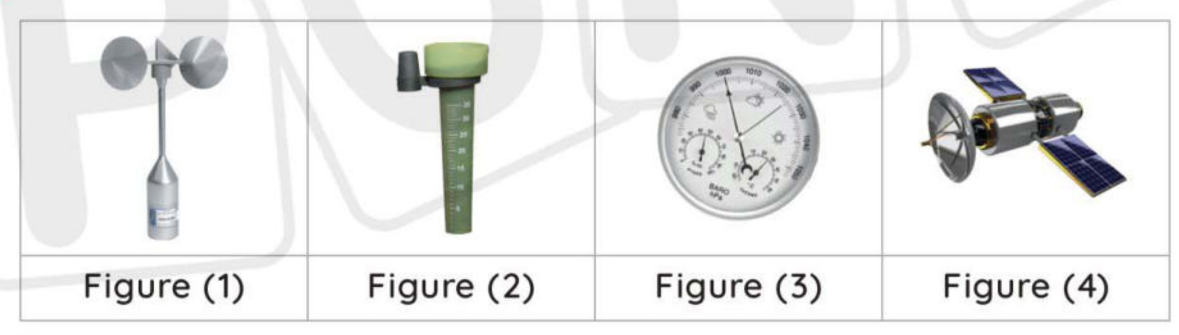


Figure (1)	Figure (2)	Figure (3)	Figure (4)

1 The instrument in figure (3) can measure current atmospheric pressure. (   )

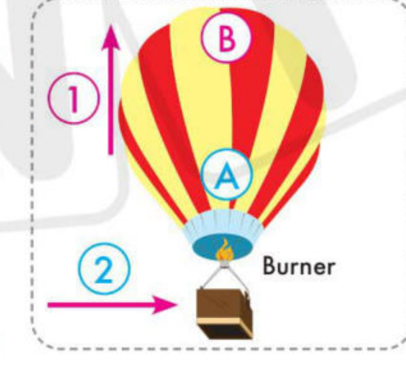
2 The instrument in figure (1) can measure the amount of rainfall. (   )

3 The instrument in figure (4) can predict the path of a hurricane. (   )

4 The instrument in figure (1) is used to measure the speed of a tornado's wind blowing. (   )

5 The instrument in figure (2) helps you compare the amount of rain falling in spring seasons. (   )

7 Study the following figure, then choose the correct answer:



1 The air in .... is warmer.
(area "A" – area "B")

2 When the air in area "A" heats up, it ....
(sinks – rises)

3 When the air in area "B" cools, it becomes .... dense, so it ....
(more, sinks – more, rises – less, sinks)

4 The arrow number .... represents the movement of the wind.
(1 – 2)

8 Give reasons for:

1. The Sun is responsible for the creation of wind on Earth.

....

....

2. The air current differs from the wind.

....

....

3. On blowing talcum powder over a lighted lamp, the talcum powder rises up.

....

....

9 What happens if:

1. You hold a paper spiral over a lighted lamp?

....

....

2. The air close to the Earth's surface is heated?

....

....

3. You put a rain gauge in a farm on a rainy day?

....

....

4. The air in the clouds becomes cold enough?

....

....

Lesson 4



Activity 8 Extreme Weather: Floods and Sandstorms



Put (✓) or (✗):







1. Drought and flooding result from water imbalance. ( )
2. Drought and flooding cause destructive effects. ( )

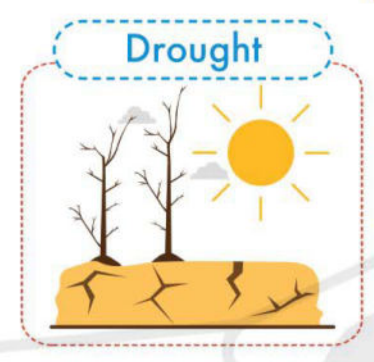
- In recent years, there has been an increase in the number of extreme weather events worldwide.
- The number and severity of weather disasters are expected to increase in the future due to global climate change.

• في السنوات الأخيرة كانت هناك زيادة في عدد الظواهر الجوية القاسية في جميع أنحاء العالم.

• من المتوقع أن يزداد عدد وشدة الكوارث المناخية في المستقبل بسبب تغير المناخ العالمي.

Weather Disasters

Drought



Flooding



Sandstorms



Extreme precipitation events, with too much or too little rain, can:

1. Change ecosystems.
2. Cause damage to human structures and the agricultural system.
3. Lead to injuries and deaths.

• هطول الأمطار الشديدة، مع الكثير أو قليل جدًا من المطر، يمكن أن يغير النظم البيئية وتحدث أضرارًا للمنشآت التي بناها الإنسان والنظم الزراعية، كما يمكن أن يؤدي إلى وقوع إصابات ووفيات.

Concept 2

Drought

It is the lack of available water for growing crops, farming animals, industry, and cities.

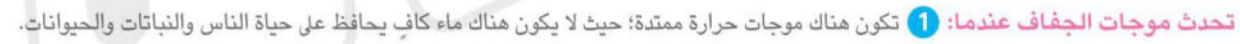
الجفاف: هو نقص المياه اللازمة لزراعة المحاصيل وتربية الحيوانات والصناعة والمدن.



Droughts occur when:

1. There is a long period of dry weather where there's not enough water to sustain people, plants, and animals.

2. There are extended heat waves during atmospheric weather cycles.



تحدث موجات الجفاف عندما: ① تكون هناك موجات حرارة ممتدة؛ حيث لا يكون هناك ماء كافٍ يحافظ على حياة الناس والنباتات والحيوانات.

② تكون هناك موجة حارة ممتدة لدورات الطقس الجوية.

Flooding

It is the overflow of water on the land around riverbanks edges due to the rapid increase in rainfall flow on the river.

الفيضان: تدفق المياه على الأرض الجافة المجاورة لضفاف النهر بسبب زيادة معدل هطول الأمطار على النهر.



Floods may occur due to:

1.
- The rapid increase in the flow of rainfall on a river.
- It occurs approximately every two years in the natural system.
- قد تحدث فيضانات بسبب الزيادة السريعة في تدفق الأمطار على النهر. يحدث تقريبًا كل عامين في المعدل الطبيعي.

2.
- The sudden melting of snow and ice over a region.
- قد تحدث فيضانات بسبب الانصهار المفاجئ للثلج والجليد في منطقة ما.

NOTES:

- More extreme floods take place less frequently.
- Every few decades, very extreme floods will occur.
- These infrequent floods that humans are not prepared for cause the most damage and loss of life.





Flooding is worse if the ground is frozen.
Because the frozen ground cannot absorb water.

• يكون الفيضان أشد خطورة إذا حدث على أرض متجمدة؛ لأن الأراضي المتجمدة لا تستطيع امتصاص مياه الفيضان.

Harms of Flooding

1. It damages buildings by causing water damage or by moving or breaking them.
2. It can lead to the drowning of people and livestock.
3. It can disrupt lives and economies.

أضرار الفيضانات:
• إتلاف المباني من خلال اندفاع المياه، أو عن طريق تحريك المباني أو تحطيمها.
• من الممكن أن تؤدي إلى غرق البشر والماشية.
• تعطيل الحياة والاقتصاد.

NOTE:
- In general, ecosystems eventually recover from flooding.
- Some ecosystems even rely on periodic flooding, like those along the Nile.

• في العموم تتعافى النظم البيئية في نهاية الفيضانات.
• هناك بعض النظم البيئية التي تعتمد على الفيضانات الدورية مثل النظم البيئية الموجودة على طول نهر النيل.

Sandstorms (Dust storms)
- They are solid walls of debris and dust traveling along the horizon.



Formation of Sandstorms

1. Sandstorms are formed when very strong winds blow up sand or dust from an extremely dry area.

• تتشكل العواصف الرملية عندما تهب رياح قوية جدًّا الرمال أو الغبار من منطقة شديدة الجفاف.

2. Sandstorms are common in deserts but can also happen in an area that has experienced prolonged drought.

• العواصف الرملية شائعة في الصحاري، ولكن يمكن أن تحدث أيضًا في منطقة شهدت جفافًا طويلًا.

Properties of Sandstorms



1. They look like solid walls of debris and dust traveling along the horizon.
2. They can be several miles long and thousands of feet high, which makes them easy to see.

• خصائص العواصف الرملية: ❶ تكون شبيهة بجدار صلب من الحطام والغبار المتطاير في الأفق.
❷ من الممكن أن يصل طولها إلى أميال ويبلغ ارتفاعها آلاف الأقدام؛ مما يسهل رؤيتها.

Harms of Sandstorms

• Other than seeing a wall of brown dust approaching in the distance, you will not have much warning before a sandstorm arrives.

1 Reducing visibility for motorists:

Sandstorms are especially hazardous to motorists. G.R

Because they greatly reduce visibility, that may cause road accidents.

2 Sandstorms are often accompanied by high winds that carry debris that causes much damage, such as:

• Dust can build up on solar panels.	Leads to →	• Disrupting their power.
• Dust can fill irrigation canals.	Leads to →	• Affecting water quality.

Dust can:
• Disrupt plane travel.
• Damage plane's engines.

• Inhaling dust or being blown into the eyes.	→	• poses health risks.

مخاطر العواصف الرملية:
❶ تمثل العواصف الرملية خطورة بشكل خاص على قائدي المركبات لأنها تقلل الرؤية بشكل كبير.
❷ غالبًا ما تكون العواصف الرملية مصحوبة برياح شديدة تحمل الحطام وتسبب أضرارًا مثل:
• من الممكن أن يتراكم الغبار على الألواح الشمسية؛ مما يؤدي إلى تعطيل توليد الطاقة.
• يمكن أن يملأ الغبار قنوات الري؛ مما يؤثر في جودة المياه.
• يمكن أن يؤدي الغبار إلى تعطيل الرحلات الجوية وإتلاف المحركات.
• يمكن أن يشكل الغبار أيضًا مخاطر صحية إذا تم استنشاقه أو عند دخوله في العينين.







Unit 3

Activity 9 Circle Back: Heat and Weather Changes

Now that you have learned about weather patterns, look again at Farming the Desert. You first saw this in Wonder.



Question:

How can you describe Farming the Desert now?





My Claim:

....

....

....



Evidence:



....

....

....



Scientific Explanation with Reasoning:



....

....

....

Exercises on Lesson 4

1 Choose the correct answer:

1. .... is/are the main reason of many weather disasters.
   a. Ocean currents b. Pandemics
   c. Global climate changes d. Earth's rotation

2. All the following are considered weather disasters, except ....
   a. drought b. floods c. sandstorms d. wind

3. Extreme precipitation may cause all the following, except ....
   a. destroying buildings b. changing an ecosystem
   c. improving an ecosystem d. human injuries

4. Many floods occur when the level of water in a .... increases so much that it overflows.
   a. plain b. dune c. mountain d. river

5. .... may happen in an area when it does not rain for a long time.
   a. Floods b. Droughts c. Wildfires d. Earthquakes

6. The extended heat waves may cause ....
   a. floods b. droughts c. volcanoes d. earthquakes

7. The sudden melting of snow and ice over a region causes ....
   a. floods b. droughts c. fires d. tornadoes

8. .... damages buildings by moving or breaking them.
   a. Gentle wind b. Flooding c. Drought d. Ocean breeze

9. All the following are among the hazards of flood, except ....
   a. breaking buildings b. drowning of cattle
   c. improving economy d. drowning of people

10. Sandstorms are most common in ....
    a. polar regions b. deserts
    c. rainforests d. green landscapes

11 Sandstorms occur when strong wind blows up ....

a. snow and dust
b. sand and water vapor
c. sand and dust
d. dust and hail

12 .... looks like a solid wall of debris and dust traveling along the horizon.

a. A flood
b. A drought
c. An earthquake
d. A sandstorm

2 Put (✓) or (✗):

1 Drought and flooding have no harmful effects. (   )

2 Very extreme floods take place less frequently. (   )

3 A drought means that there is more water available for growing crops. (   )

4 People are always prepared for infrequent flooding. (   )

5 Ecosystems can't recover from flooding. (   )

6 Every few decades, a very extreme flood may occur. (   )

7 You should wear a face mask during a sandstorm to not inhale any dust. (   )

8 Dust from sandstorms may build up on solar panels, disrupting their power. (   )

9 A sandstorm increases the visibility of motorists, so more road accidents occur. (   )

10 Gentle wind can cause a sandstorm. (   )

11 In sandstorms, sand and dust are blown by the wind from an extremely humid area. (   )

12 A frozen ground can absorb the water when flooding occurs. (   )

13 Sandstorms can be several miles long and thousands of feet high. (   )

3 Write the scientific term:

1. It is a phenomenon where water is not available for growing crops or farming animals. (..................)
2. It is the overflow of water on the land around riverbanks due to the increase in rainfall flowing on the river. (..................)
3. It is a solid wall of debris and dust traveling along the horizon. (..................)

4 Complete the following using the words between the brackets:

(engines - periodic - debris - visibility - solid wall - water quality)

1. A sandstorm looks like a .... of .... and dust traveling along the horizon.
2. Ecosystems along the Nile rely on .... floods.
3. When the dust of a sandstorm fills the irrigation canals, it affects the ....
4. The dust of a sandstorm can disrupt traveling planes and damage their ....
5. Sandstorms can reduce .... for motorists, which may cause road accidents.

5 Cross out the odd word:

- Sandstorm – Water cycle – Flood – Drought (..................)



6 Study the following figures, then complete:



Figure (1)



Figure (2)



Figure (3)

1. A dry weather for a long period of time causes the disaster in figure (..........).
2. The disasters in figures (..........) and (..........) are caused by extreme low or high precipitation.
3. The disaster in figure (..........) may harm your eyes.

4 The disaster in figure (..........) reduces the visibility for cars' drivers.

5 The disaster in figure (..........) may cause the drowning of people.

7 Give reasons for:

1 The number of weather disasters is expected to increase in the future.

....

2 Drought may occur.

....

3 Flooding is worse if the ground is frozen.

....

4 You should wear a face mask during a sandstorm

....

5 Sandstorms can be hazardous to motorists.

....

6 Sandstorms cause health risks for people.

....

8 What happens if:

1 An ecosystem is exposed to a long period of dry weather?

....

2 The water flows over the edges of a riverbank and onto the land around the river?

....

3 The snow and ice melts suddenly over a region?

....

4 The dust of a sandstorm fills the irrigation canals?

....

5 The dust accumulates on solar panels?

....

Model Exams on Concept 3.2

Model Exam 1

Question 1

(A) Choose the correct answer:

1. Warm moist air condenses at high elevations due to the ....
   a. high temperature b. low temperature
   c. high atmospheric pressure d. sunlight
2. Putting data on a weather map represents .... in weather prediction.
   a. gathering data b. collecting data
   c. analyzing data d. putting it all together
3. .... pulls the heavy water droplets in clouds downward.
   a. Humidity b. Gravity c. Wind d. Sunlight
4. All the following are considered weather disasters, except ....
   a. drought b. flooding c. sandstorms d. wind

(B) Write the scientific term:

It's an area on the dry side of a mountain range where rainfall is reduced.

Question 2

(A) Put (✓) or (✗):

1. Technology has no role in the evolution of predicting weather conditions. ( )
2. Changes in pressure and wind speed can predict changes in the weather. ( )
3. Sandstorms can be several miles long and thousands of feet high. ( )
4. Atmospheric pressure at a mountain's foot is less than that at its top. ( )

(B) Cross out the odd word:

Weather maps – Barometer – Satellites – Temperature (........)

Question 3

(A) Choose from column (A) what suits it in column (B):

(A)	(B)
1 Anemometers	a. are used to power farms in deserts.
2 Drought	b. are used to measure the wind speed.
3 Wind turbines	c. are instruments used to measure the temperature.
4 Thermometers	d. occurs when there is no rain for a long time.

(B) Give a reason for: Air currents differ from wind.

Model Exam 2

Question 1

(A) Choose the correct answer:

1. Sandstorms are most common in ....
   a. polar regions b. deserts c. rainforests d. green landscapes
2. If the temperature at the top of the mountain is 10°C, then the temperature at its bottom might be .... °C.
   a. 10 b. 5 c. 0 d. 20
3. .... is the slowest material that heats up.
   a. Sand b. A rock c. Soil d. Water
4. .... is the measure of the amount of water vapor in the air.
   a. Humidity b. Temperature
   c. Wind d. Atmospheric pressure

(B) What happens if:

The water flows over the edges of a riverbank and onto the land around the river?

Question 2

(A) Put (✓) or (✗):

1. Floods may cause the drowning of livestock. ( )
2. Weather balloons are designed to carry measurement tools up high in the atmosphere. ( )
3. Weather satellites can predict the possible path of a hurricane. ( )
4. Ecosystems can't recover from flooding. ( )

(B) Cross out the odd word: Desert - Rainforest - Climate - Grassland

Question 3

(A) Complete the sentences using the words between the brackets:

(fertile – faster – Wind – solid wall – slower)

1. Water heats .... than sand.
2. .... is created by the unequal heating of Earth's surface.
3. A sandstorm looks like a .... of debris and dust traveling along the horizon.
4. Farmers use innovative ways to make the dry desert soil ....

(B) Mention one use for: Barometers.

School Book

Assess Your Learning on Unit 3

Choose the correct answer:

1. The climate is ....
   a. the amount of rain an area receives
   b. the state of the atmosphere at a specific place and time
   c. the air temperature
   d. the average weather condition over an extended period of time

2. When we say, "The average temperature this week was 35 degrees." Thus, half the ....
   a. climate b. humidity c. weather d. load currents

3. The temperature may reach more than 50 degrees in Aswan in the summer. This reflects the ....
   a. humidity b. atmosphere c. weather d. climate

4. Which of the following statements is correct?
   a. Water and land usually have the same temperature.
   b. Water heats and cools faster than the Earth's surface.
   c. The Earth's surface heats and cools faster than water.
   d. The Earth absorbs and stores more thermal energy than the oceans and seas.

5. The anemometer is used to measure ....
   a. adaptation b. rainfall c. evaporation d. wind speed

6. .... is the transformation of water vapor into liquid water droplets in the air.
   a. Transpiration b. Evaporation c. Condensation d. Melting

7. The thermometer is used to ....
   a. measure the temperature
   b. know tomorrow's weather
   c. predict the time of rain
   d. measure the wind speed

8. The evaporation of water from plant leaves is called ....
   a. condensation b. transpiration c. rainfall d. freezing

9. What happens when the clouds become so heavy that they cannot hold water?
   a. Water falls on the ground.
   b. Water evaporates.
   c. Another cloud forms.
   d. The clouds become very large.

10. Among the forms of precipitation are ....
    a. rain, hail, and snow
    b. the Sun, rain, and snow
    c. seas, rivers, and oceans
    d. mountains, valleys, and rivers

11. The amount of water vapor in the air is known as ....
    a. humidity
    b. evaporation
    c. condensation
    d. a cloud

12. In the convection process, heat is transferred from ....
    a. high to low
    b. wet areas to dry areas
    c. cold regions to warm regions
    d. warm regions to cold regions

13. The main factor affecting the movement of wind and water on the Earth's surface is ....
    a. the unequal solar heating system
    b. the transpiration process in plants
    c. the evaporation process from oceans and seas
    d. the flow of water across the Earth's surface due to gravity

14. Oceans help improve the world's climate through ....
    a. heat absorption
    b. nitrogen gas absorption
    c. salt storage
    d. water storage

15. At the tops of mountains, the air pressure is .... the pressure at the foot of the mountains.
    a. higher than
    b. less than
    c. equal to
    d. vanishing compared to

PONY

سلسلة كتب الاستاذ

SCIENCE

FINAL REVISION

6th

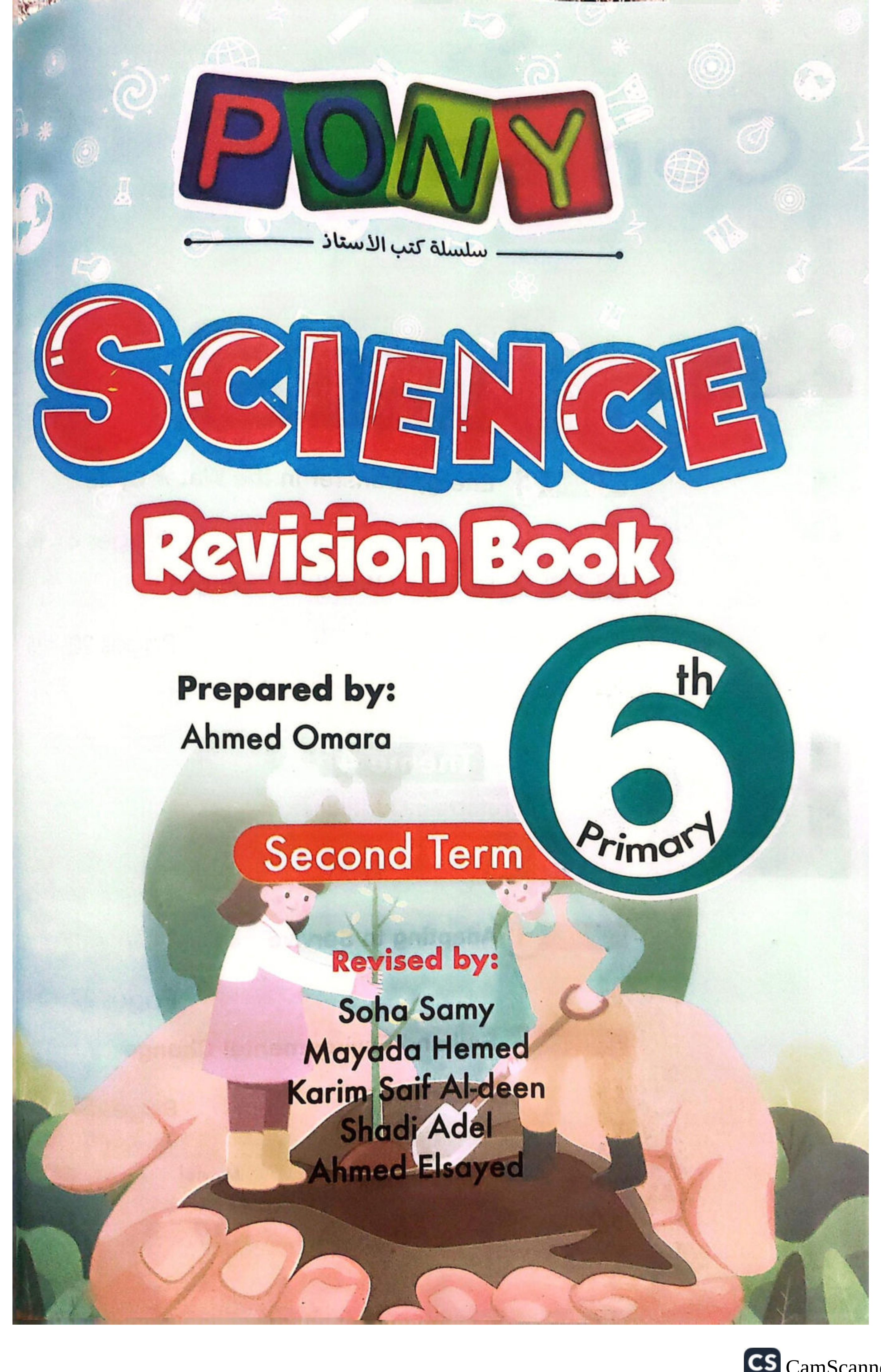
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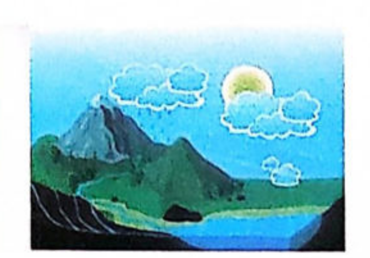
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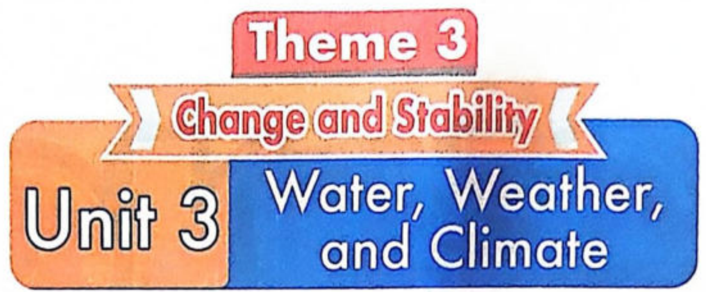



PONY
سلسلة كتب الأستاذ
SCIENCE
Revision Book
Prepared by:
Ahmed Omara
6th
Primary
Second Term
Revised by:
Soha Samy
Mayada Hemed
Karim Saif Al-deen
Shadi Adel
Ahmed Elsayed



Contents

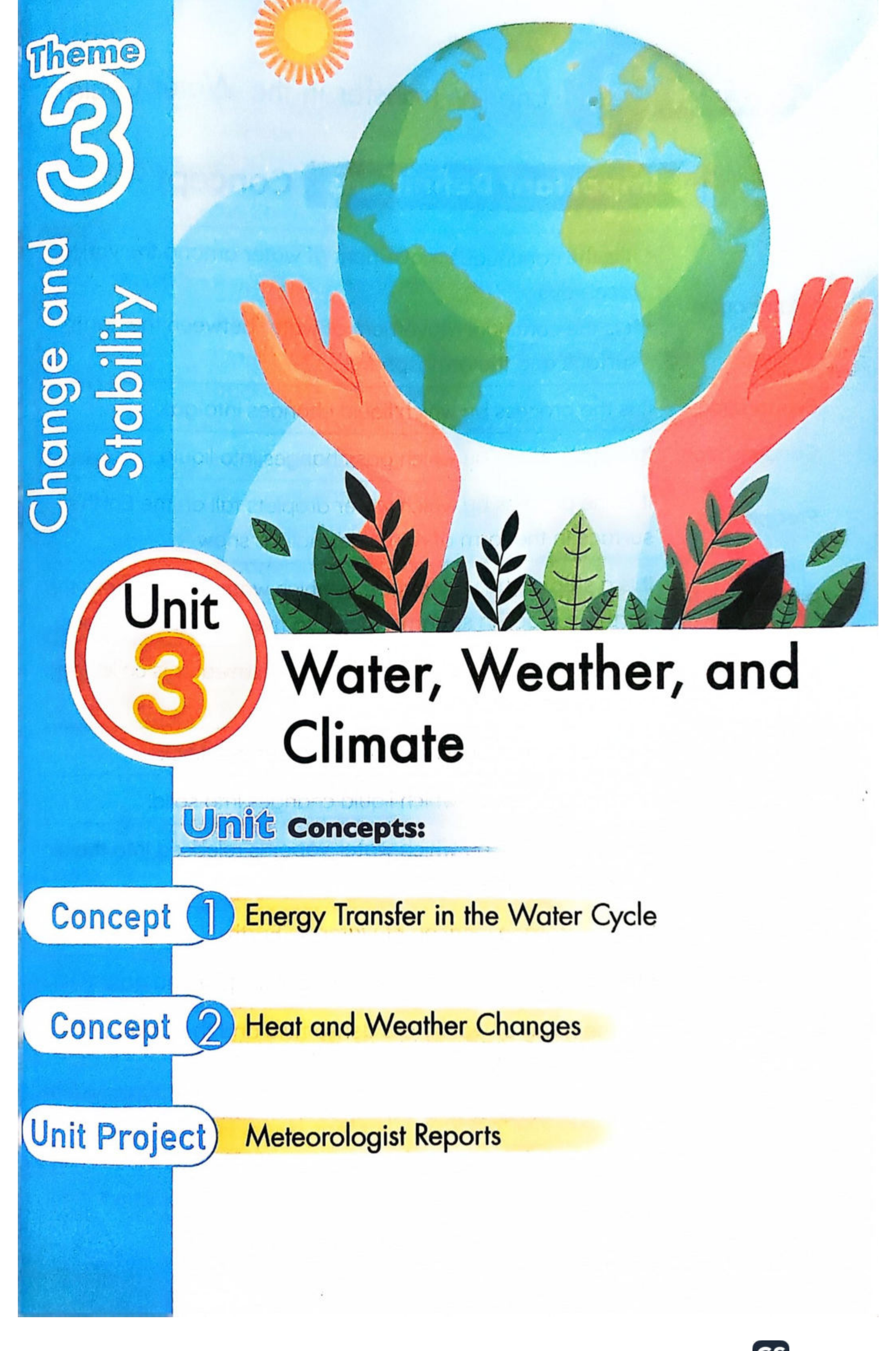



Theme 3
Change and Stability
Unit 3
Water, Weather, and Climate




Theme 4
Protecting Our Planet
Unit 4
Adapting to Change




Theme 3
Change and Stability
Unit 3
Water, Weather, and Climate
Unit Concepts:
Concept 1 Energy Transfer in the Water Cycle
Concept 2 Heat and Weather Changes
Unit Project Meteorologist Reports

Concept 1 Energy Transfer in the Water Cycle

1 Important Definitions Concept 1

Water cycle	• It is the continuous movement of water among the various reservoirs. • It is the continual movement of water between the Earth's surface and the atmosphere.
Evaporation	It is the process by which liquid changes into gas.
Condensation	It is the process by which gas changes into liquid.
Precipitation	It is the process by which water droplets fall on the Earth's surface in the form of rain, sleet, hail, or snow.
Runoff	It is a step of the water cycle in which water flows across the Earth's surface in streams, then into rivers, lakes, or oceans.
Collection	It is a step of the water cycle in which rainwater is collected in a bigger body of water.
Melting	It is the process by which solid changes into liquid.
Freezing	It is the process by which liquid changes into solid.
Transpiration	It is the process by which water vapor is released into the air by the plant's leaves.
Reservoir	It is the storage location of water on Earth.
Convection	• It is a way that heat transfers through liquid and gas.
Convection current	It is the rising of warm, less dense fluid and the sinking of cold, denser fluid.

2 Importances Concept 1

Solar energy	• It provides the energy to melt ice and evaporate water on the Earth's surface. • It is the energy that drives the water cycle. • It provides energy to generate wind.
Gravity	• It is the basic force that drives the water cycle. • It pulls ice crystals and water droplets from clouds to fall back to the Earth's surface. • It pulls solid water (ice) to flow in glaciers from areas of higher elevation to areas of lower elevation. • It causes water to percolate down into the ground to the groundwater reservoirs. • It causes the rise and fall of the different densities, creating a circulation of convection currents.
Convection current	• It produces wind and ocean currents. • It helps in determining regional climates.
Wind	It has a role in transporting water to different locations on Earth during the water cycle.

3 Important Comparisons Concept 1

① Evaporation process and condensation process:

Evaporation Process	Condensation Process
It is the process of changing water into water vapor.	It is the process of changing water vapor into water droplets, forming clouds.
In the water cycle: The water in the bodies of water gains heat energy from the Sun and turns it into water vapor.	In the water cycle: Water vapor cools (releases energy) and turns into water droplets, forming clouds.



2 Melting process and freezing process:

Melting Process	Freezing Process
It is the process of changing a solid into a liquid by heating.	It is the process of changing a liquid into a solid by cooling.
Its particles absorb energy.	Its particles release energy.

3 Transpiration process and precipitation process:

Transpiration Process	Precipitation Process
It is the process by which water vapor is released into air by the plant's leaves.	It is the process by which water falls on the Earth's surface in the form of rain, sleet, hail, or snow.

4 Earth's climate zones:

Hottest Regions	Moderate Regions	Coolest Regions
They are regions close to the equator.	They are regions located between the hottest and coolest regions.	They are regions close to the North and South Poles of the Earth.
They have high temperatures.	They have moderate temperatures.	They have very low temperatures.
They have the highest evaporation rate.	They have a moderate evaporation rate.	They have the lowest evaporation rate.



4 Give Reasons for... Concept 1

1. Sunlight is important for the water cycle.
   - Because it provides the needed energy to melt ice into water or evaporate water into water vapor.
2. The water levels in puddles may rise or fall.
   - Due to the energy transfer during the water cycle.
3. Fog may be formed over a field in the early morning.
   - Due to the condensation of water vapor in the air.
4. Climate affects the evaporation rate.
   - Because as the climate gets hotter, more evaporation occurs, and vice versa.
5. Water flows in glaciers from a higher to a lower elevation area.
   - Due to the force of gravity.
6. Water flows downhill in streams to a bigger body of water.
   - Due to the force of gravity.
7. A puddle in a hot desert becomes smaller and smaller.
   - Due to the evaporation of the puddle's water by the Sun.
8. The dust particles in the air help in the precipitation process.
   - Because many water droplets in the air stick and accumulate on the dust particles, forming clouds.
9. Transpiration process has an important role in the water cycle.
   - Because about 10% of the water vapor in the air is released from the transpiration process occurring in plants' leaves.
10. Evaporation and condensation are two opposite processes.
    - Because evaporation is the change of liquid into gas by heating, while condensation is the change of gas into liquid by cooling.
11. The water droplets in clouds fall on the Earth's surface in the form of rain.
    - Because the water droplets become too heavy to be held by the clouds, so they are pulled down by gravity.
12. Convection currents have an important role in the condensation process in the atmosphere.
    - Because warm air rises up to be cooled, and it condenses, forming clouds.



13. The Sun is responsible for convection currents in the atmosphere and ocean
    - As the air and water on the Earth's surface are heated by the Sun, the become warmer and rise, while colder and denser air and water fall dow
14. Cold air sinks, while warm air rises up.
    - Because cold air is denser than warm air.
15. You feel very hot if you live near the equator.
    - Because the vertical sun rays are focused on a small area.
16. Polar regions have the lowest average of temperature on Earth.
    - Because sun rays fall with low angle where sun rays are distributed on very large area.
17. Solar radiation is responsible for the creation of wind.
    - Because the air warmed by the Sun rises, and it is replaced by cooler a from nearby.

5 What happens if: Concept 1

1. Water vapor rises in the air?
   - Water vapor cools and condenses, forming clouds.
2. You travel to a city near the equator?
   - The climate becomes cooler.
3. A small puddle is exposed to an extreme hot weather?
   - The puddle may dry up.
4. Gravity causes liquid water to percolate down into the ground?
   - Water is collected as a groundwater reservoir.
5. Warm, moist air touches a cold glass of water?
   - The moist air condenses forming water droplets.
6. The particles of water absorb heat energy?
   - The water evaporates and turns into water vapor.
7. You wrapped a plastic bag around a plant?
   - Water droplets are formed inside the plastic bag.
8. The Sun heats up the water in oceans, lakes, and rivers?
   - Liquid water will change into water vapor and rise to the atmosphere.
9. Water droplets become too heavy in the clouds?
   - Water droplets will fall to the Earth's surface in the form of rain.

10. Sun rays fall on the water in the oceans and rivers?
    - The water in oceans and rivers evaporates and rises to be cooled and condensed.

11. Precipitation hits the Earth's surface?
    - It may flow on the land as runoff.

12. Water droplets in clouds become too heavy?
    - They precipitate in the form of rain, snow, or hail.

13. The air near the Earth's surface is heated?
    - The air becomes warmer and lighter, so it rises up in the air.

14. You travel to a city away from the equator? (Concerning the weather)
    - The temperature decreases.

15. You travel to a city near the equator? (Concerning the weather)
    - The temperature and precipitation rate increase.

16. The amount of Sun's radiation reaching all parts of the Earth is equal?
    - Wind will not be formed.

17. Warmed air carrying water vapor rises up in convection currents?
    - It loses the water in the form of rain.

18. Cooled, dry air descends and reaches the Earth's surface?
    - It forms a group of deserts around the planet.

6 Main Points Concept 1

- Flamingos migrate and breed to a salty lake in Turkey when the weather is warm.
- Flamingos feed on algae.
- The amount of solar radiation that reaches any area on the Earth's surface is unequal.
- The unequal heating of land and oceans causes different temperatures and densities in the ocean and atmosphere, causing ocean currents and wind.
- Even in a dry desert environment, the water cycle takes place.
- The water cycle has no starting point or ending point.

States of water:

- Water exists in nature in three states.
- In the water cycle, water changes from one state to another by absorbing or releasing energy.
- When a gas or a liquid is heated, it becomes less dense and it rises up.
- When a gas or a liquid is cooled, it becomes denser and it sinks.

Examples of water reservoirs:

- Oceans, seas, rivers, lakes, glaciers, groundwater, soil, rocks, atmosphere and living organisms.

Clouds are formed when:

- Condensed water droplets stick and collect on particles of dust, pollens and smoke in the air.
- Clouds are made up of billions of water droplets in the air.

Precipitation:

- When precipitation hits Earth in the form of rain, snow, or hail.
- It may flow across the land as runoff.
- Runoff is collected in streams, rivers, lakes, or oceans.

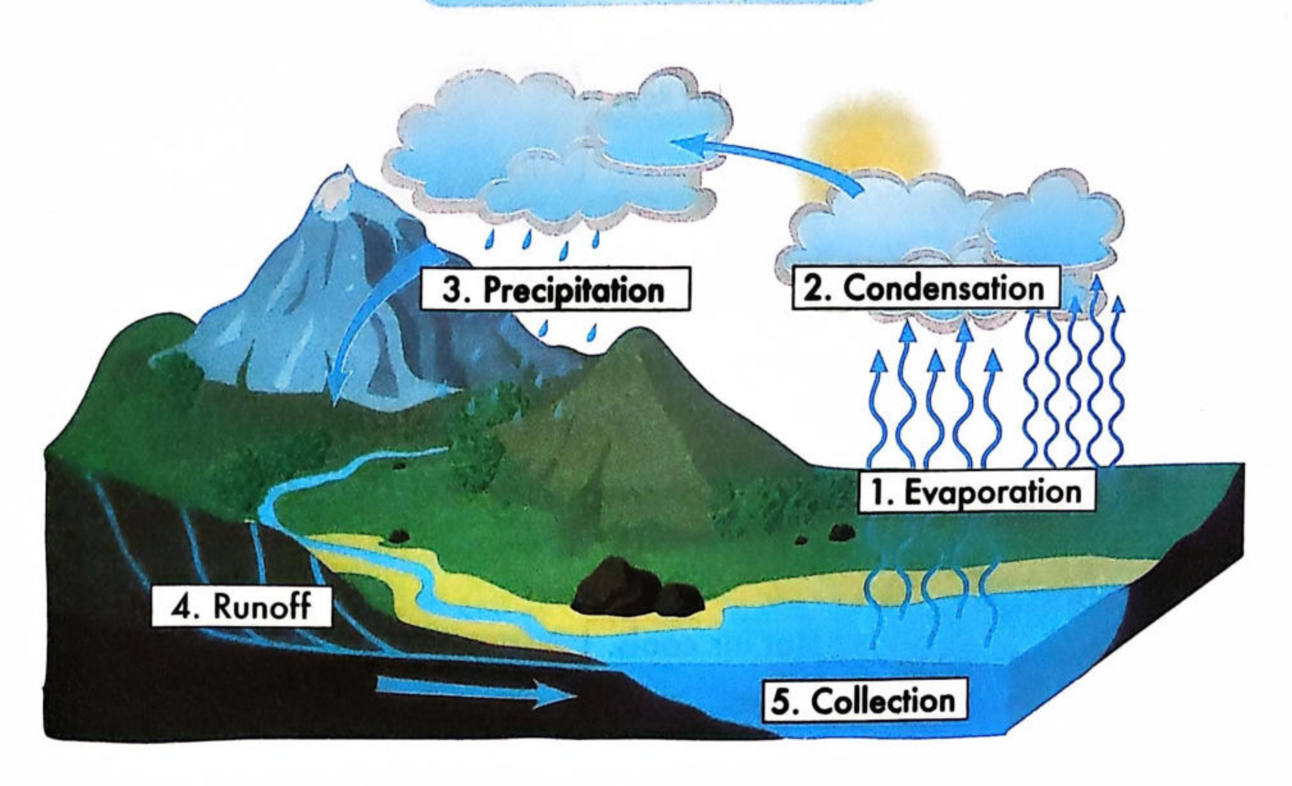
The wind direction is determined by two factors:

- The amount of solar radiation that the Earth receives at different latitudes
- The rotation of Earth

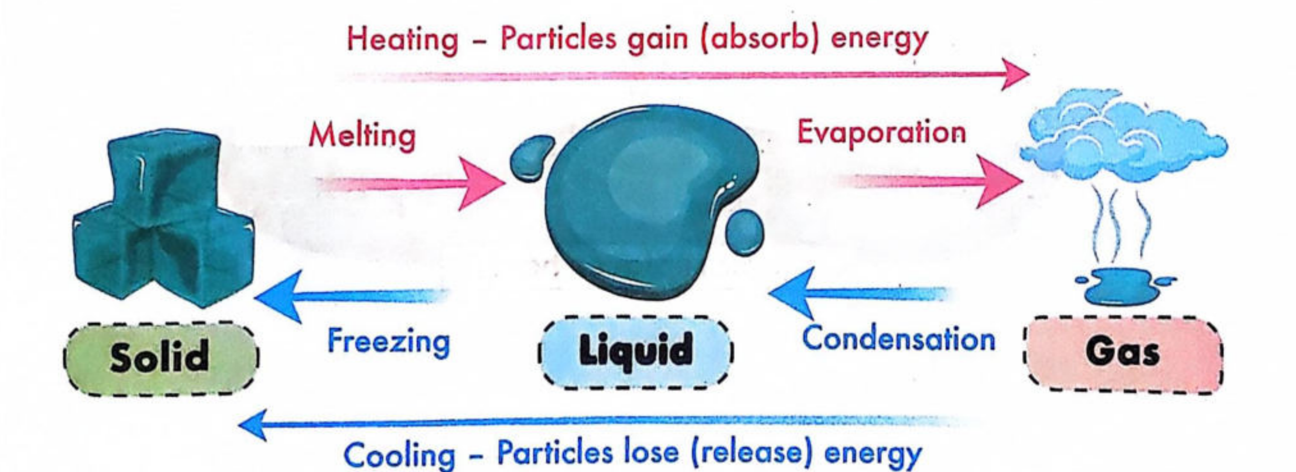
- Wind blows when warmed air by the Sun is replaced by cooler nearby air.
- Earth has a global wind system that consists of winds that blow in a constan direction over long periods of time.
- The Sun's heat reaches the Earth's atmosphere through space by radiation
- Heat energy is transferred throughout the Earth's atmosphere as convectior
- Convection currents happen in the atmosphere, water, and Earth's mantle.
- About 10 % of the water vapor in the air comes from the transpiration proces carried out by plants.

7 Important Diagrams Concept 1

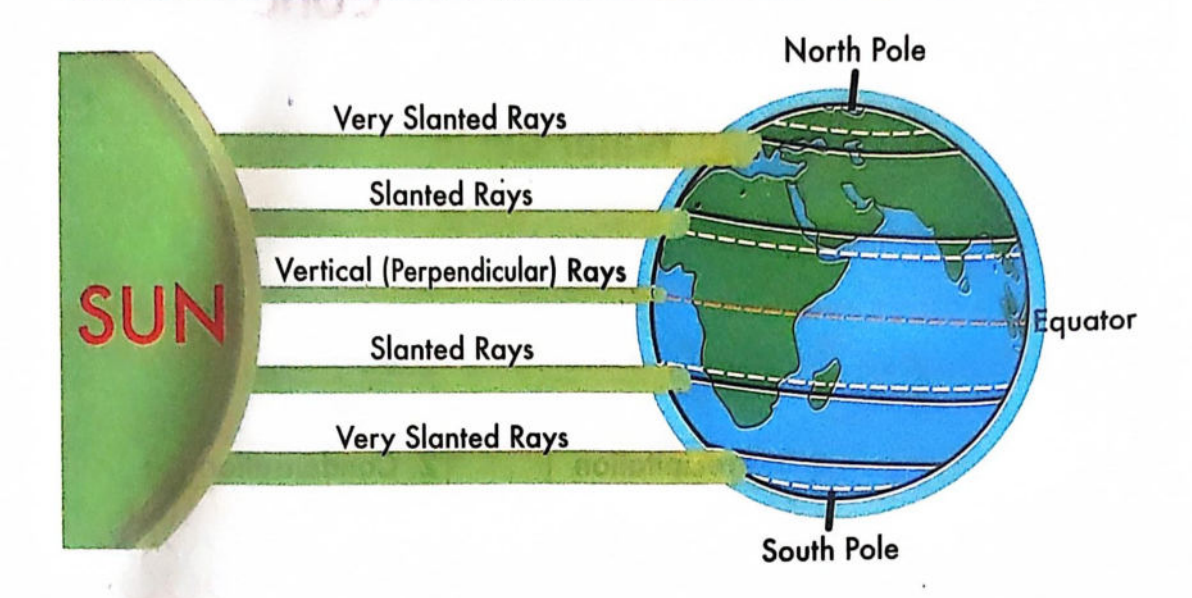
1 Water Cycle



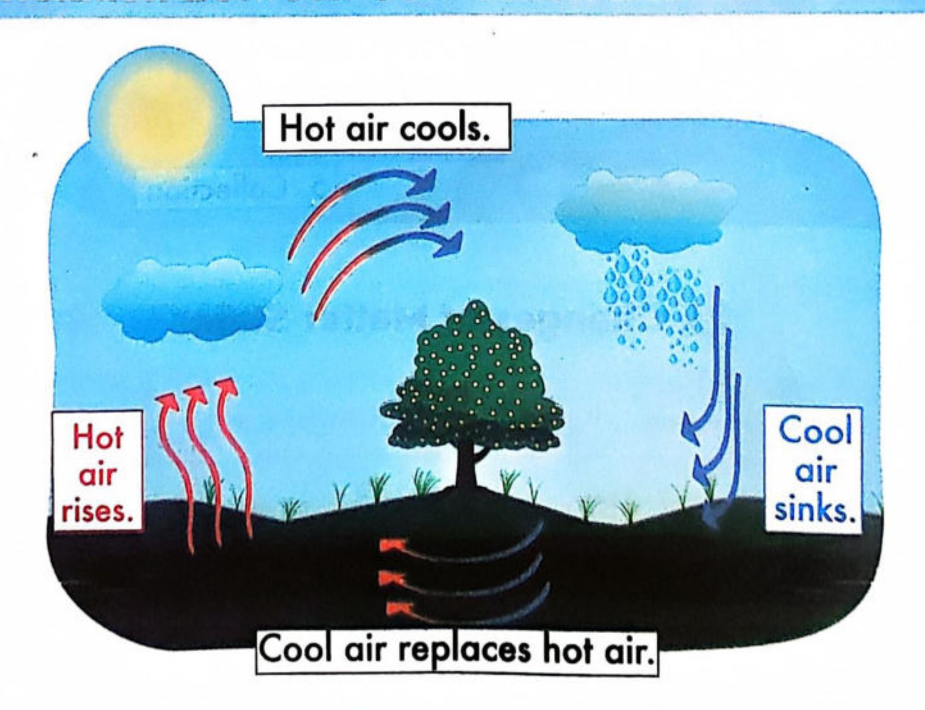
2 Changes of Matter States



3 Distribution of Solar Radiation on Earth's Surface



4 Relation Between Convection and Condensation



8 Revision on Concept 1

1 Choose the correct answer:

1. Convection currents are responsible for all the following, except ....
   a. creation of wind b. ocean currents
   c. determining the climatic zones d. ocean tides
2. .... are considered forms of precipitation.
   a. Rain, snow, and hail b. Sun, rain, and snow
   c. Oceans, rivers, and seas d. Mountains, valleys and rivers
3. In thermal convection, heat transfers from ....
   a. high altitudes to low altitudes b. moist to dry regions
   c. cool to warm regions d. warm to cool regions
4. All the following processes are involved in the water cycle, except ....
   a. evaporation b. filtration c. precipitation d. condensation
5. The flowing of water along the Earth's surface to lakes and oceans is called ....
   a. rainfall b. runoff c. precipitation d. condensation
6. When there is more sun rays falling on a plant's leaf, its transpiration rate ....
   a. increases b. decreases c. doesn't change d. disappears
7. All the following occur during the condensation process, except ....
   a. formation of clouds b. absorbing energy
   c. releasing energy d. water vapor turning into liquid
8. The basic force that drives water in the water cycle is the force of ....
   a. gravity b. evaporation c. magnetism d. pressure
9. The .... is /are responsible for the movement of wind.
   a. water cycle b. ocean tides c. solar energy d. sound energy
10. Flamingos feed on .... in the lake's shallow water.
    a. algae b. sharks c. hawks d. ducks

11. Sun heat reaches the Earth's atmosphere by ....

a. radiation b. conduction c. convection d. condensation

12. Water moves from oceans to the atmosphere by the .... process and returns to the Earth's surface by the .... process.

a. condensation - evaporation b. evaporation - precipitation

c. precipitation - evaporation d. condensation - precipitation

13. When water vapor condenses, the liquid water forms ....

a. steam b. clouds c. runoff d. air

14. When water vapor rises in the atmosphere, it cools and ...., forming ....

a. evaporates - clouds b. condenses - clouds

c. melts - ice d. freezes - oxygen

15. What causes convection currents in the Earth's atmosphere?

a. The unequal heating on land and the aquatic bodies by the Sun

b. The equal heating on land and the aquatic bodies by the Sun

c. The runoff water on land

d. The transpiration process in plants

16. Wind's direction is affected by ....

a. the moon's revolution b. the Sun's rotation

c. Earth's revolution d. Earth's rotation

17. Water vapor must .... before it precipitates back down to Earth

a. evaporate b. condense c. melt d. freeze

18. .... is produced when heat from the Sun creates convection currents.

a. An earthquake b. A volcano c. Wind d. Humidity

19. The highest rate of evaporation occurs in the .... regions.

a. hottest b. Arctic c. coolest d. moderate

20. Convection currents occur in all the following, except in ....

a. Earth's mantle b. solids c. liquids d. gases

2 Put (✓) or (✗):

1. Transpiration produces about 10% of the water vapor in the atmosphere. (   )
2. Transpiration occurs in plant roots. (   )
3. Fog forms on fields in the early morning due to the condensation process. (   )
4. The water cycle has no start or end. (   )
5. Condensation and freezing processes need absorbing energy. (   )
6. The water level in a puddle increases due to the energy transferred to it. (   )
7. The water cycle doesn't occur in hot deserts. (   )
8. Wide leaves lose more water vapor than small leaves during the transpiration process. (   )
9. The water cycle occurs on land only. (   )
10. The transpiration rate increases at night. (   )
11. The human body is considered a water reservoir. (   )
12. When water vapor gains energy, it turns into water droplets. (   )
13. The water cycle is a continuous process that doesn't stop. (   )
14. Earth's rotation on its axis affects the wind direction. (   )
15. Moist air masses form a group of deserts around the world. (   )
16. The evaporation process occurs when the water molecules lose energy. (   )
17. Countries near the two poles have the coolest climate. (   )
18. There is no energy transfer occurring in the water cycle. (   )
19. The wind won't blow if all regions on the Earth's surface have the same temperature. (   )
20. Cool air is more dense than warm air. (   )
21. Convection currents cause the movement of ocean currents. (   )
22. The regions between the equator and the North Pole have a moderate climate. (   )

3 Write the scientific term:

1. They are formed when water vapor condenses and comes together in the air. (..............................)

2. It is the process by which water in the atmosphere falls back on the Earth's surface in the form of rain or snow. (..................)
3. It is a storage location of water on Earth. (..................)
4. It is the continuous movement of water among various reservoirs. (..................)
5. It is one of the Earth's layers that contains convection currents. (..................)

4 Choose from column (A) what suits it in column (B):

A

Column (A)	Column (B)
1. Gravity	a. helps determine the regional climates on Earth.
2. Earth's rotation	b. is the force that pulls the rain down.
3. Condensation	c. is a form of evaporation that takes place in plants.
4. Transpiration	d. is the opposite process of evaporation.

1. .... 2. .... 3. .... 4. ....

B

Column (A)	Column (B)
1. A shallow river drying up	a. is the source of solar radiation on the Earth's surface.
2. Glaciers	b. is an example of evaporation.
3. Clouds	c. are reservoirs that are made up of water in its solid state.
4. The Sun	d. are made up of billions of tiny water droplets.

1. .... 2. .... 3. .... 4. ....

5 Complete the following using the words between the brackets:

A (wind – migrate – force – ocean currents – warm – cooled)

1. Flamingos prefer to .... and breed when the weather becomes ....
2. Water starts to move when a .... is exerted on it
3. The convection currents occurring in water causes ...., while the convection currents occurring in air generates ....
4. When the water particles are ...., they become more dense.

B (convection currents – atmosphere – global wind system – Soil – directions – condenses)

1. .... and .... are considered water reservoirs.
2. The .... allow the falling and rising of air with different densities.
3. Earth has .... that consist of winds that blow in constant .... over long periods of time.

C (force – densities – less – convection currents – energy transfer – evaporation)

1. In the water cycle, ... causes the change of the water state, while the .... of wind and gravity moves water among water reservoirs.
2. Hot air is .... dense than cool air.
3. Shallow rivers dry up due to the .... process.
4. Inside an oven, ... occur due to the change of the air particles temperatures and ....

6 Correct the underlined words:

1. The amount of water changes during the water cycle. (....................)
2. When water condenses, it changes from a gas into a solid. (....................)
3. The radiant energy of the Sun causes ice to freeze and turn into a liquid. (....................)

4. When water molecules lose energy, they expand and become less dense. (..................)

5. When the water droplets in the clouds become light, water precipitates. (..................)

7 Give reasons for:

1. Sunlight has an important role in the water cycle.

....

....

2. The amount of transferred energy affects the rate of evaporation of a puddle's water.

....

....

3. Water flows in glaciers from a higher to a lower elevation area.

....

....

4. You feel very hot if you live near the equator.

....

....

5. There is too little rain in deserts around the world.

....

....

6. Solar radiation is responsible for the creation of wind.

....

....

8 What happens if:

1. There are no particles of dust, smoke, or pollens in the atmosphere?

....

....



2. You wrapped a plastic bag around a plant?

....

....

3. Precipitation hits the Earth's surface?

....

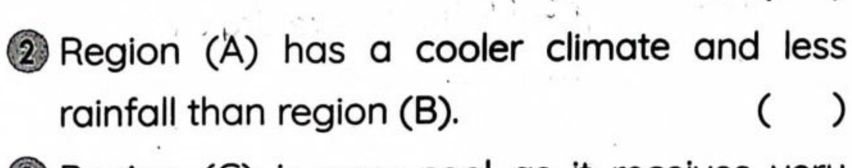
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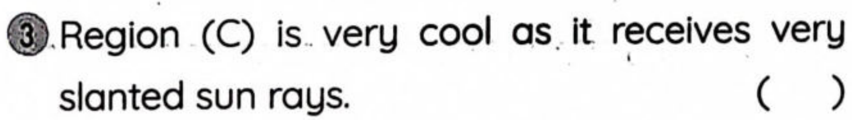
4. There is no wind on the Earth? (Concerning the ocean currents)

....

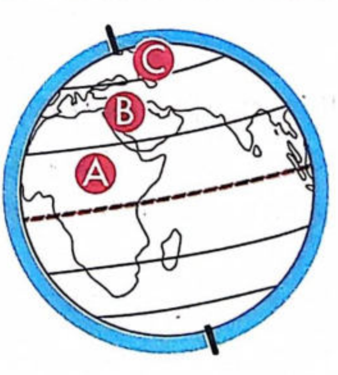
....

9 Complete the following diagram:





10 Study the following figure, then put (✓) or (✗):



1. Wind moves from region (A) to region (B). ( )
2. Region (A) has a cooler climate and less rainfall than region (B). ( )
3. Region (C) is very cool as it receives very slanted sun rays. ( )

Concept 2 Heat and Weather Changes

1 Important Definitions Concept 2

Meteorology	It is the science that studies and predicts the weather.
Meteorologist	He/She is the scientist that uses a variety of instruments to study and forecast weather.
Rain shadow	• It is an area on the dry side of a mountain range where rainfall is reduced.
Atmospheric pressure	• It is the weight of the air column above a location. • It is the amount of force that air exerts on its surroundings.
Humidity	It is the measure of how much water vapor is present in the air.

2 Important Comparisons Concept 2

① Wet side and dry side of a mountain range:

Wet Side	Dry Side
It is the side of the mountain that faces the wind carrying warm, humid air from a nearby ocean.	It is the side where dry air forms a "rain shadow" area.

② Change of atmosphere state by changing elevation from the sea level:

Descending Towards a Mountain's Bottom	Climbing Towards a Mountain's Top
The air density, temperature, and atmospheric pressure increase.	The air density, temperature, and atmospheric pressure decrease.

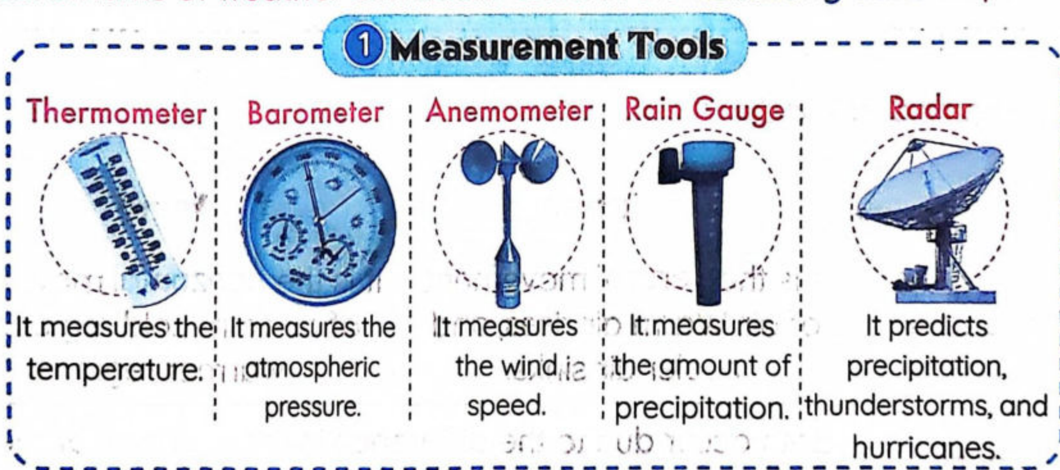
3 Temperature of sand and water at day and night:

	Heating	Cooling	At Day	At Night
Sand	It heats up fast.	It cools fast.	Sand has a higher temperature than water.	Sand has a lower temperature than water.
Water	It heats up slowly.	It cools slowly.		

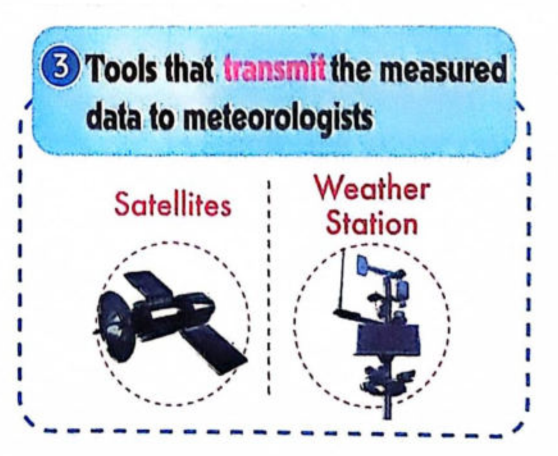
4 Weather of coastal regions and desert regions:

	Day Temperature	Night Temperature
Coastal Regions	Moderate (because water heats up slowly.)	Moderate (because water cools slowly.)
Desert Regions	High (because sand heats up quickly.)	Low (because sand cools quickly.)

5 Instruments of weather conditions used in the collecting data step:







6 Steps of the weather prediction process:

1 Collecting Data

Collecting data about weather by using measurement tools, such as:

- Thermometers
- Barometers
- Anemometers
- Rain gauge
- Weather balloons
- Satellites
- Satellite station

2 Analyzing Data

Meteorologists use:

① Mapping:

By putting weather measurements into maps to identify weather patterns.

② Weather maps:

To send information to meteorologists and the public.

3 Putting It all Together



Meteorologists:

① Apply what they know about the effect of landforms on the atmosphere.

② Use complex computer models to predict interactions between weather factors.

---

7 Air current and Wind:

	Air Current	Wind
Differences	It is the vertical movement of air. Warm air rises, and cooler air sinks.	It is the horizontal movement of air from cold regions to warmer regions.
Similarities	Both occur due to the difference in temperature of the air on Earth's surface.	

8 Weather disasters:

	Drought	Flood	Sandstorm
Definition	It is the lack of available water for growing crops, farming animals, industry, and cities.	It is the overflow of water on the land around riverbanks due to the rapid increase in rainfall flowing on the river.	It is a solid wall of debris and dust that travels along the horizon.
Reasons	• There is a long period of dry weather. • The extreme rising of temperature	• The rapid increase of the flow of rainfall • The sudden melting of snow and ice over a region	• Very strong winds blow up the sand or dust from an extremely dry area. • It happens in an area that has experienced prolonged drought.
Hazards	• It changes the ecosystem due to the lack of water.	• Damage of buildings by breaking or moving them. • Drowning of people and livestock. • Disrupting of lives and economies	The debris and dust carried by sandstorms: • Reduce the visibility of motorists. • Disrupts planes travel and damage their engines. • Causes health risks on inhaling dust or entering the eyes. • Disrupts solar panels power by building up dust on them. • Decrease water quality in the irrigation canals.

3 Give Reasons for... Concept 2

1. Farming is difficult in desert biomes.
   - Due to the hot, dry climate of deserts.
2. Farmers reuse water to irrigate crops in the desert.
   - To overcome the little rainfall.
3. Farmers are powering desert farms with solar panels and turbines.
   - To take advantage of the solar energy and wind conditions.
4. Mountains' ranges cause the rain shadow effect.
   - Because they block the humid air coming from a nearby ocean, so the other side becomes dry.
5. The rain shadow area contains less plants than the wet side of a mountain
   - Because there is more rainfall on the wet side than the dry side.
6. There might be snow on the top of a mountain.
   - Because the temperature decreases by increasing the elevation from the sea level.
7. Hikers would find difficulty in breathing on the top of a mountain.
   - Because the air density decreases by increasing the elevation from the sea level.
8. Weather balloons are designed to carry the measurement tools high in the atmosphere.
   - To collect the weather data from different altitudes.
9. Mapping data about weather is very important.
   - To identify weather patterns.
10. Meteorologists use complex computer models.
    - To predict changes and interactions between weather factors.
11. Satellites and weather stations are very important in the weather prediction process.
    - Because they transmit weather data to meteorologists.

12. The sand on the beach is hotter than the sea water at daytime.
    - Because sand heats up faster than water.
13. Coastal regions have moderate weather.
    - Because the seawater heats up and cools slowly.
14. Technology is very important for meteorologists.
    - Because it helps them predict and forecast weather accurately.
15. The Sun is responsible for the creation of wind on Earth.
    - Because when air is warmed, it rises up and is replaced by the cooler and denser nearby air.
16. Air current differs from wind.
    - Because air moves vertically in air current due to convection current, but wind blows horizontally.
17. On blowing powder over a lighted lamp, the powder rises up.
    - Because when the particles of powder is heated, it becomes lighter and rises up.
18. Flooding is worse if the ground is frozen.
    - Because the ground cannot absorb water.
19. Infrequent floods cause the most damage and loss of life.
    - Because people are not prepared for these floods.
20. The number of weather disasters is expected to increase in the future.
    - Due to global climate change.
21. Drought may occur.
    - Due to a long period of dry weather or the extreme rising of temperature.
22. You should wear a face mask during a sandstorm.
    - To not inhale the dust from the sandstorm.
23. Sandstorms can be hazardous to motorists.
    - Because it reduces the visibility for motorists.
24. Sandstorms cause health risks to people.
    - Because the dust from sandstorms may enter people's eyes or get inhaled.

4 What happens if (to): Concept 2

1. Warm humid air rises up?
   - It cools and condenses, then it precipitates.
2. A hiker climbs a mountain? (According to the atmospheric pressure)
   - The atmospheric pressure will decrease.
3. A hiker descends a mountain? (According to the temperature)
   - The temperature will increase.
4. The reading of a hiker's barometer on climbing a mountain?
   - The barometer reading will drop (decrease).
5. The reading of a thermometer, when you move it from the beach's sand t the sea water at night?
   - The thermometer reading will rise up (increase).
6. Humidity if you move towards a coastal city?
   - Humidity will increase due to the increasing amount of water vapor in the a
7. The temperature of the beach sand at night?
   - The temperature will decrease as the sand cools very fast.
8. The air close to the Earth's surface is heated?
   - Air rises up and is replaced by a colder and denser nearby air.
9. You put an anemometer in an area where there is a tornado?
   - The anemometer calculates the tornado's speed.
10. You put a rain gauge in a farm on a rainy day?
    - The rain gauge calculates the amount of precipitation (rainfall).
11. The air in the clouds becomes cold enough?
    - Snow or ice crystals are formed.
12. An ecosystem is exposed to a long period of dry weather?
    - Drought may occur.
13. The water flows over the edges of a riverbank and onto the land around the river?
    - It causes flooding.
14. Snow and ice suddenly melt over a region?
    - It causes flooding.
15. The dust of a sandstorm fills the irrigation canals?
    - It affects the quality of water in the irrigation canals.
16. Dust accumulates on solar panels?
    - It disrupts the power of the solar panels.



Desert biome:

- The climate of the desert is hot and dry, or arid.
- The desert has the least amount of rain compared to other biomes.
- Population growth pushes more people to settle on desert land.
- In the desert, more water evaporates than falls by precipitation.

Rain shadow phenomena:

- Rain shadow is formed when a mountain range blocks the warm, humid air coming from a nearby ocean.
- It is formed on the dry side of the mountain.

Weather:

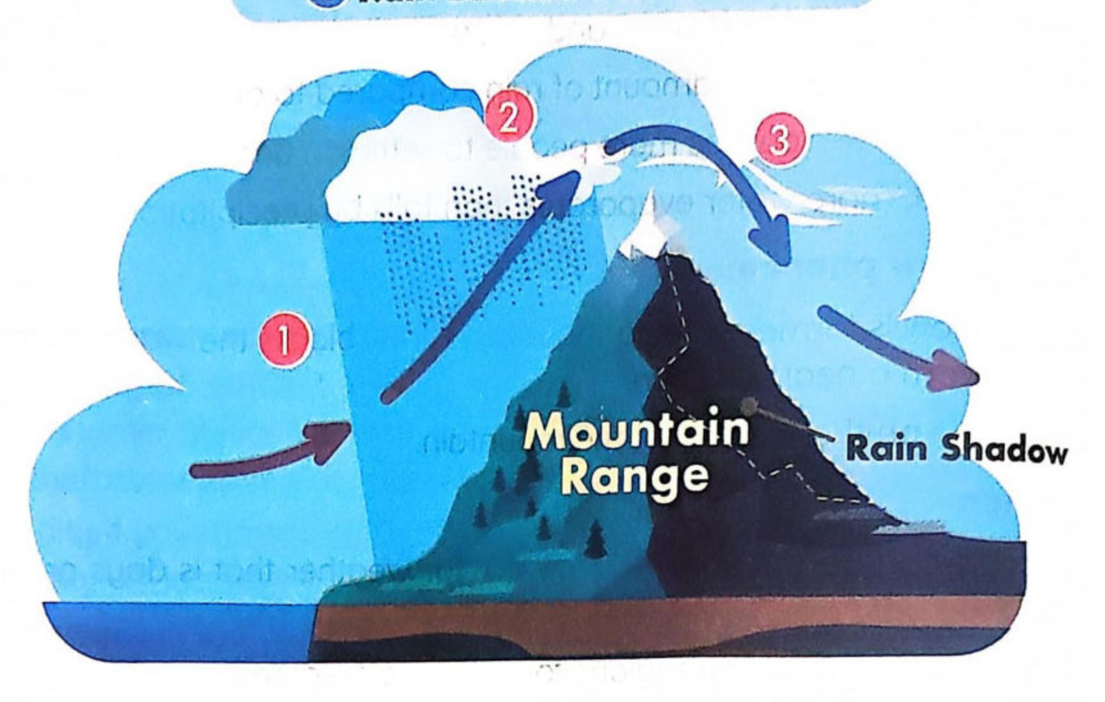
- Forecasts can be particularly uncertain for weather that is days or weeks away.
- Wind blows from cold air regions to warmer air regions.
- In convection currents:
  - Warm air (less dense) rises, and cold air (denser) sinks.
  - Cold air replaces warm air because it is denser.

Extreme weather disasters:

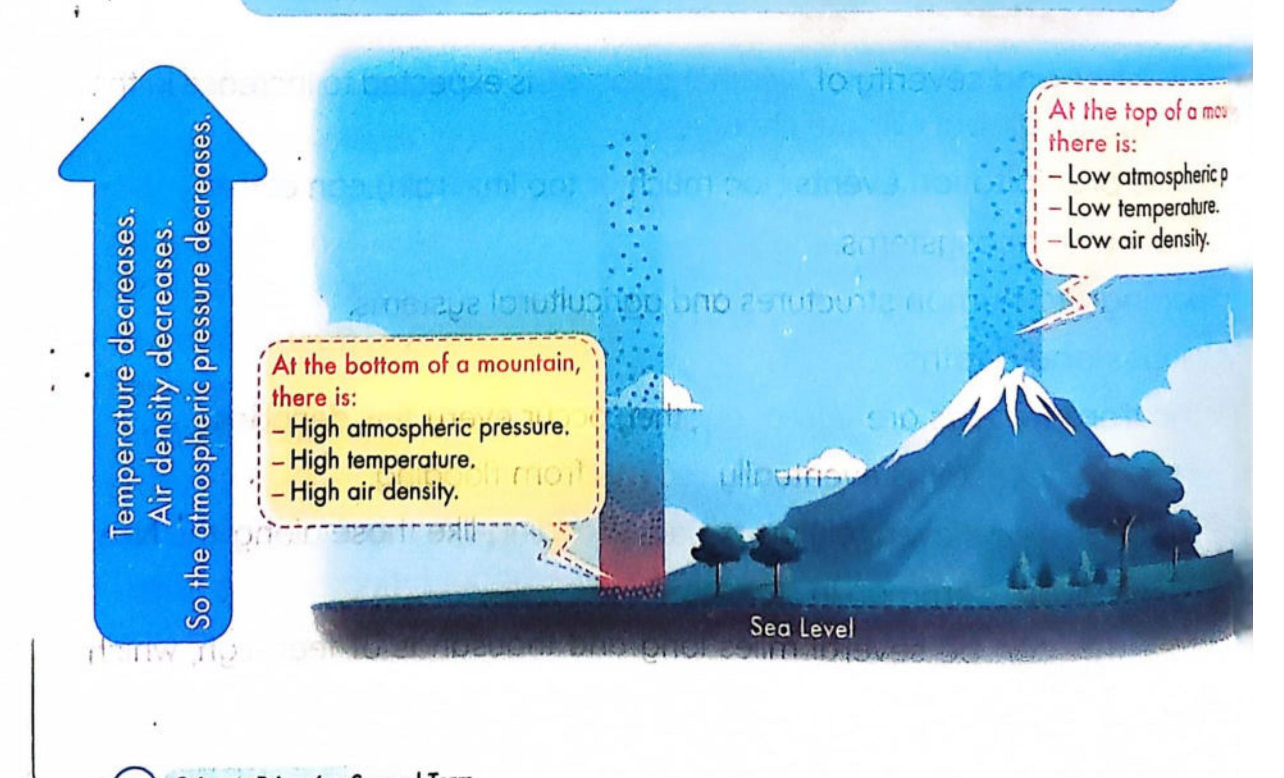
- The number and severity of weather disasters is expected to increase in the future due to global climate change.
- Extreme precipitation events (too much or too little rain) can cause:
  - Change of ecosystems.
  - Damage to human structures and agricultural systems.
  - Injuries and deaths.
- Very extreme floods are infrequent; they occur every few decades.
- In general, ecosystems eventually recover from flooding.
- Some ecosystems even rely on periodic flooding, like those along the Nile.
- Sandstorms are common in deserts.
- Sandstorms can be several miles long and thousands of feet high, which makes them easy to see.

6 Important Diagrams Concept 2

1 Rain Shadow Phenomena



2 Changes of Atmospheric Pressure by Changing the Elevation from the Sea Level



7 Revision on Concept 2

1 Choose the correct answer:

1. Oceans help in improving the climate around the world by ....
   a. absorbing the heat b. absorbing nitrogen gas
   c. storing salt d. storing water

2. The force exerted by air on the surrounding area is measured by a/an ..... .
   a. thermometer b. barometer c. anemometer d. rain gauge

3. .... is the biome that receives the least amount of rainfall per year.
   a. Tropical rainforest b. Grassland
   c. Polar regions d. Desert

4. .... are the landforms that cause the rain shadow phenomenon.
   a. Lakes b. Plains c. Mountains d. Valleys

5. It is hard to breathe on the top of a mountain due to ....
   a. the increased percentage of oxygen
   b. the high density of air
   c. the high temperature d. the low density of air

6. Meteorologists use a barometer to measure the ....
   a. temperature b. atmospheric pressure
   c. humidity d. mass

7. Applying what meteorologists know about the effect of different landforms on weather is called ....
   a. mapping data b. collecting data
   c. analyzing data d. putting it all together

8. Which statement is correct about water and sand?
   a. Water heats up faster than sand.
   b. Water needs less energy than sand to heat up.
   c. Sand heats up slower than water.
   d. Sand needs less energy than water to heat up.

9. When air particles are heated, all the following occur, except that ....
   a. air particles expand b. air becomes denser
   c. air becomes less dense d. air rises

10. The horizontal movement of air along the Earth's surface is called ...
   a. air currents   b. atmosphere   c. wind   d. pressure
11. A weather radar can predict all the following, except ....
   a. snow   b. rain   c. sleet   d. sunlight
12. Snow falls when the air in clouds becomes .... enough to form ice crysta
   a. warm   b. colorful   c. cold   d. hot
13. All the following are considered weather disasters, except ....
   a. droughts   b. floods   c. sandstorms   d. winds
14. Extreme precipitation may cause all the following, except ....
   a. destroying buildings
   b. changing an ecosystem
   c. improvement of an ecosystem
   d. human injuries
15. The sudden melting of snow and ice over a region causes ....
   a. flooding   b. drought   c. fires   d. tornadoes
16. Sandstorms may occur in an area that has experienced ....
   a. prolonged droughts   b. short-term droughts
   c. floods   d. melting of ice
17. An anemometer is used to measure the ....
   a. atmospheric pressure   b. wind direction
   c. wind speed   d. temperature
18. A/An .... is used to measure the amount of precipitation in c area.
   a. thermometer   b. barometer
   c. anemometer   d. rain gauge
19. The atmospheric pressure at 4 km above the sea level is more th that at ....
   a. 2 km   b. 6 km   c. 3 km   d. 1 km
20. All the following are used to carry weather measurement tools at hi altitudes, except ....
   a. airplanes   b. satellites
   c. thermometers   d. weather balloons

2 Put (✓) or (✗):

1. A lot of vegetations exist on the side of the mountain, facing the wind. ( )
2. The rain shadow phenomenon is responsible for forming deserts on Earth. ( )
3. The atmospheric pressure is high at the top of Everest Mountain. ( )
4. The air density is not affected by changing the elevation from the sea level. ( )
5. The weather is similar at both sides of the mountain ranges. ( )
6. Population growth pushes more people to settle on desert land. ( )
7. Small and unexpected changes in wind or moisture in the air cannot affect next week's weather. ( )
8. Meteorologists collect data about weather conditions after analyzing them. ( )
9. Today, meteorologists use complex computer models to predict weather. ( )
10. Meteorologists map the collected data in the putting it all together stage. ( )
11. A barometer calculates the wind's speed. ( )
12. The dust of sandstorms increases the invisibility for motorists. ( )
13. An infrequent flood occurs every two years. ( )
14. People are always prepared to infrequent floods. ( )
15. Floods occurring along the Nile River are periodic ones. ( )
16. An ecosystem eventually recovers from flooding. ( )
17. Drought means there is more water available to sustain people, plants, and animals lives. ( )
18. Drought causes the drowning of livestock. ( )
19. Flooding occurs when there is a slow flow of rainfall on a river. ( )
20. All parts on the Earth's surface receive the same amount of solar energy. ( )

21. In sandstorms, sand and dust are blown by the wind from extremely humid areas. ( )
22. Satellites and weather stations are used to transmit weather data to scientists. ( )

3 Write the scientific term:

1. It is the science that studies and predicts the weather. (..........)
2. They are the scientists that use a variety of instruments to study and forecast weather. (..........)
3. It is the phenomenon that occurs when a mountain range blocks the humid air coming from a nearby ocean. (..........)
4. It is the measure of how much water vapor is present in the air. (..........)
5. It is the amount of force that air exerts on its surroundings. (..........)
6. It is the weight of the air column above an area. (..........)
7. It is the horizontal movement of air on Earth's surface. (..........)
8. It is the instrument that is used to predict the paths of hurricanes. (..........)
9. It is a weather disaster that occurs due to a long period of dry weather. (..........)
10. It is a solid wall of debris travelling along the horizon. (..........)

4 Complete the following using the words between the brackets:

A (high temperatures – Frozen grounds – fertile – vertically – fruitful – Landforms – horizontally)

1. Farmers use innovative ways to make the dry desert soil .... and ....
2. .... are from the factors that affect the atmosphere.
3. Crops that withstand .... are cultivated in the desert.
4. Air currents move ...., while wind moves .... on the Earth's surface.
5. .... can't absorb the water of flooding.

B (condenses - slower - faster - Solar panels - Wind - debris - more - precipitates)

1. Water heats up .... than sand.
2. .... is created by the unequal heating of the Earth's surface.
3. A sandstorm looks like a solid wall of .... and dust traveling along the horizon.
4. When humid air cools, it ...., then ....
5. .... are used to power farms in the desert.

5 Choose from column (A) what suits it in column (B):

A

Column (A)	Column (B)
1. Anemometers	a. are used to power farms in deserts.
2. Drought	b. are used to measure the wind speed.
3. Wind turbines	c. are instruments used to measure the temperature.
4. Thermometers	d. occurs when there is no rain for a long time.

1. .... 2. .... 3. .... 4. ....

B

Column (A)	Column (B)
1. Deserts	a. reduces the visibility of car drivers.
2. Weather stations	b. have arid climate and low-fertility soil.
3. Gravity	c. transmit weather data to meteorologists.
4. Sandstorms' dust	d. pulls the heavy water droplets downward.

1. .... 2. .... 3. .... 4. ....

6 Give reasons for:

1. Mountains' ranges cause the rain shadow effect.

   ....

2. There might be snow on the top of a mountain.

   ....

3. Weather balloons are designed to carry measurement tools high the atmosphere.

   ....

4. The sand on the beach is hotter than the sea water at daytime.

   ....

5. Flooding is worse if the ground is frozen.

   ....

6. Sandstorms cause health risks to people.

   ....

7. Sandstorms affect transportations.

   ....

7 What happens if:

1. The warm, humid air rises up?

   ....

2. A hiker climbs a mountain? (According to the atmospheric pressure)

   ....

3. The air in the clouds becomes cold enough?

   ....

4. The dust of a sandstorm fills irrigation canals?

   ....

5. The dust of a sandstorm builds up on solar panels?

   ....

8 Study the following figures, then complete:

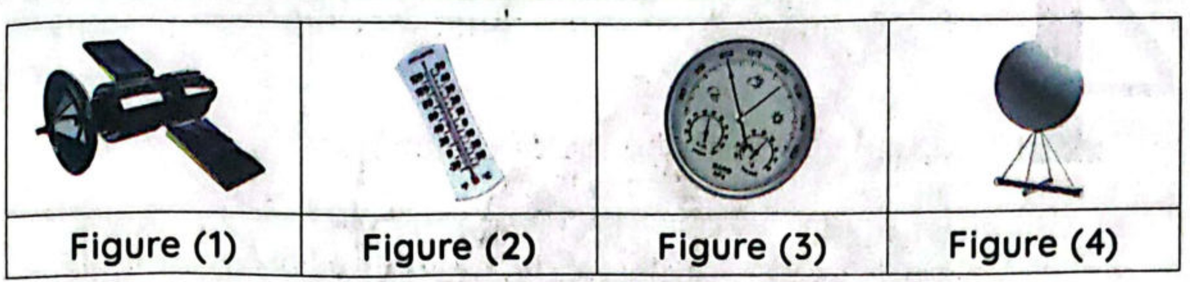


Figure (1)	Figure (2)	Figure (3)	Figure (4)

1. The instrument in figure (.........) is used to measure the temperature.
2. The instrument in figure (.........) is used to measure the atmospheric pressure.
3. Figures (.........) and (.........) are used to get weather measurements at high altitudes.
4. Figure (.........) transmits measurements about the weather to scientists from space.

9 Study the following figures, then complete:

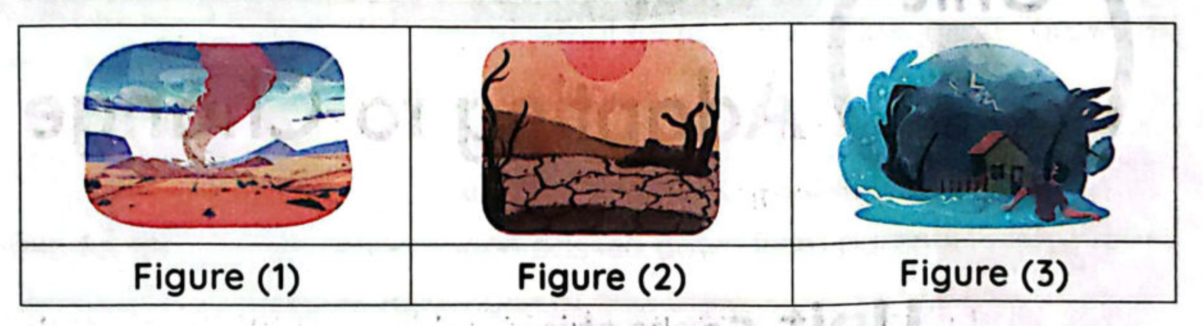


Figure (1)	Figure (2)	Figure (3)

1. A dry weather for a long period of time causes the disaster in figure (.........).
2. The disasters in figures (.........) and (.........) are caused by extreme low or high precipitation.
3. The disaster in figure (.........) may harm your eyes.
4. The disaster in figure (.........) reduces the visibility for cars' drivers.
5. The disaster in figure (.........) may cause the drowning of people.